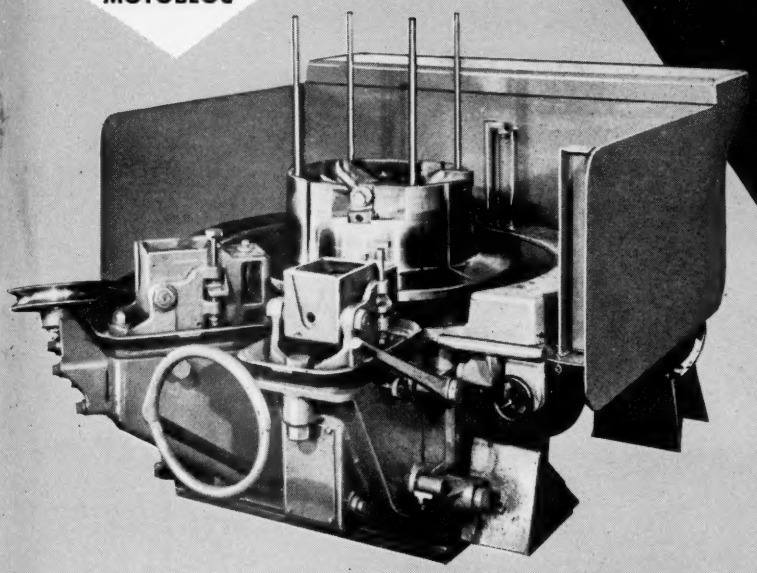
JULY 1949

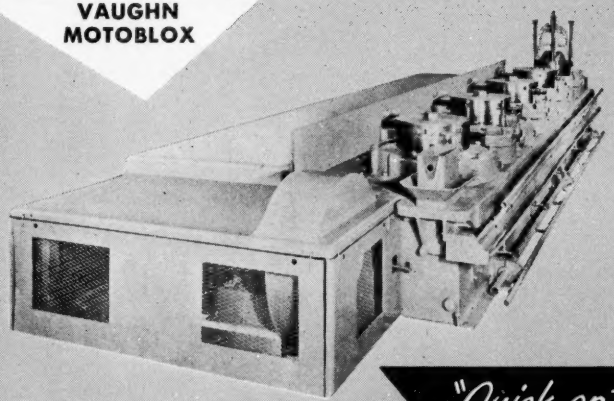
WIRE AND WIRE PRODUCTS

VAUGHN MOTOBLOC



Vaughn
WIRE DRAWING MACHINERY
means
Wire
as you want it...

VAUGHN MOTOBLOX



every working day in the year!

Vaughn Motobloc and Motoblox marry flexibility with stamina—to stay productively on the job through your toughest schedules, and always be ready for more! Specify MOTOBLOC in single or double deck types—or MOTOBLOX for continuous requirements—and you get *wire production* at a sound competitive advantage. Write!

THE VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO, U. S. A.

"Quick on the Draw!"
VAUGHN MACHINERY
Profitably used by leading wire mills since 1871

V

COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole... for the Largest Bars and Tubes ... for the Smallest Wire ... Ferrous, Non-Ferrous Materials or their Alloys.

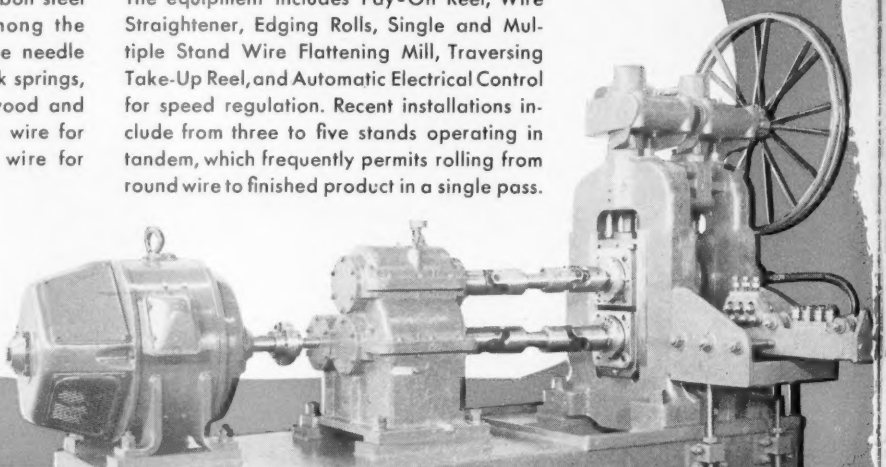
OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

WIRE FLATTENING

• The cold rolling of round wire in Wire Flattening Mills is an important production Process for producing flat and rectangular cross section wire to closely controlled tolerances in thickness and width. The process is applied to both low and high carbon steel wire and to non-ferrous wire. Among the products produced in this way are needle wire, spring wire for watch and clock springs, umbrella wire, fret-saw wire for wood and metal working, book-binding wire, wire for special steel springs, and copper wire for electrical coils

Wean Equipment Corporation has developed completely modern mills and annealing equipment for this purpose, designed and constructed to produce smoothly finished flat wire of excellent uniformity at high speed. The equipment includes Pay-Off Reel, Wire Straightener, Edging Rolls, Single and Multiple Stand Wire Flattening Mill, Traversing Take-Up Reel, and Automatic Electrical Control for speed regulation. Recent installations include from three to five stands operating in tandem, which frequently permits rolling from round wire to finished product in a single pass.

8" Single Stand Wire Flattening Mill with Wire Straighteners



General view (20 Mills on assembly line)

NARROW STRIP AND WIRE MILL MACHINERY

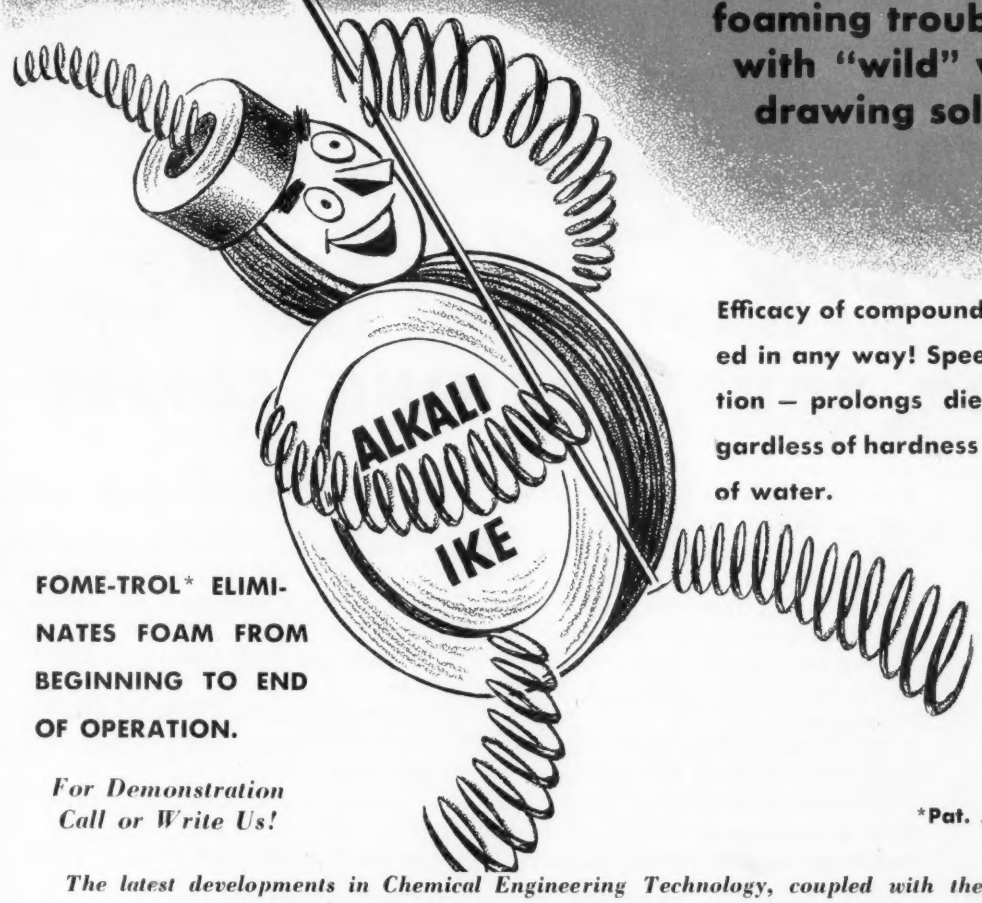
WEAN EQUIPMENT

Corporation

NOW! FOME-TROL*

Provides A Positive Method of foam-control in wire drawing solutions!

Gone are your foaming troubles with "wild" wire drawing solutions.



Efficacy of compound not affected in any way! Speeds production — prolongs die life... regardless of hardness or softness of water.

FOME-TROL* ELIMINATES FOAM FROM BEGINNING TO END OF OPERATION.

For Demonstration Call or Write Us!

***Pat. Applied for**

The latest developments in Chemical Engineering Technology, coupled with the finest of modern equipment, serve to bring you THE APEX LINE!

Apex Alkali Products Co.

MAIN & RECTOR STS., PHILADELPHIA 27, PA. • PHONE: IVyridge 3-3939

"Open Sesame"

FOR YOUR MORNING COFFEE

A few twists with this handy key and your vacuum-packed can of fresh coffee is neatly opened—ready for brewing and fragrant with the rich aroma of your favorite brand. This little gadget is also the "open sesame" for the familiar cans of crisp nuts, savory meats and chicken, shortening, candy, plum pudding, and other good things.

Like so many useful articles, this key is made from steel wire. Bethlehem has furnished many tons of can key wire. It must be ductile enough for forming into shape, sufficiently uniform for the punching of the slot, stiff enough to resist bending in use.

Steel wire has thousands of uses—and most of them call for special properties of some sort. We've made so many different kinds that the wire you need is probably a grade and quality we've furnished recently. We carefully control the manufacturing procedure from the melting of the steel to its final treatment and drawing into wire.

One of our technical men will gladly work with you to help make your wire products better and more economical.

BETHLEHEM STEEL

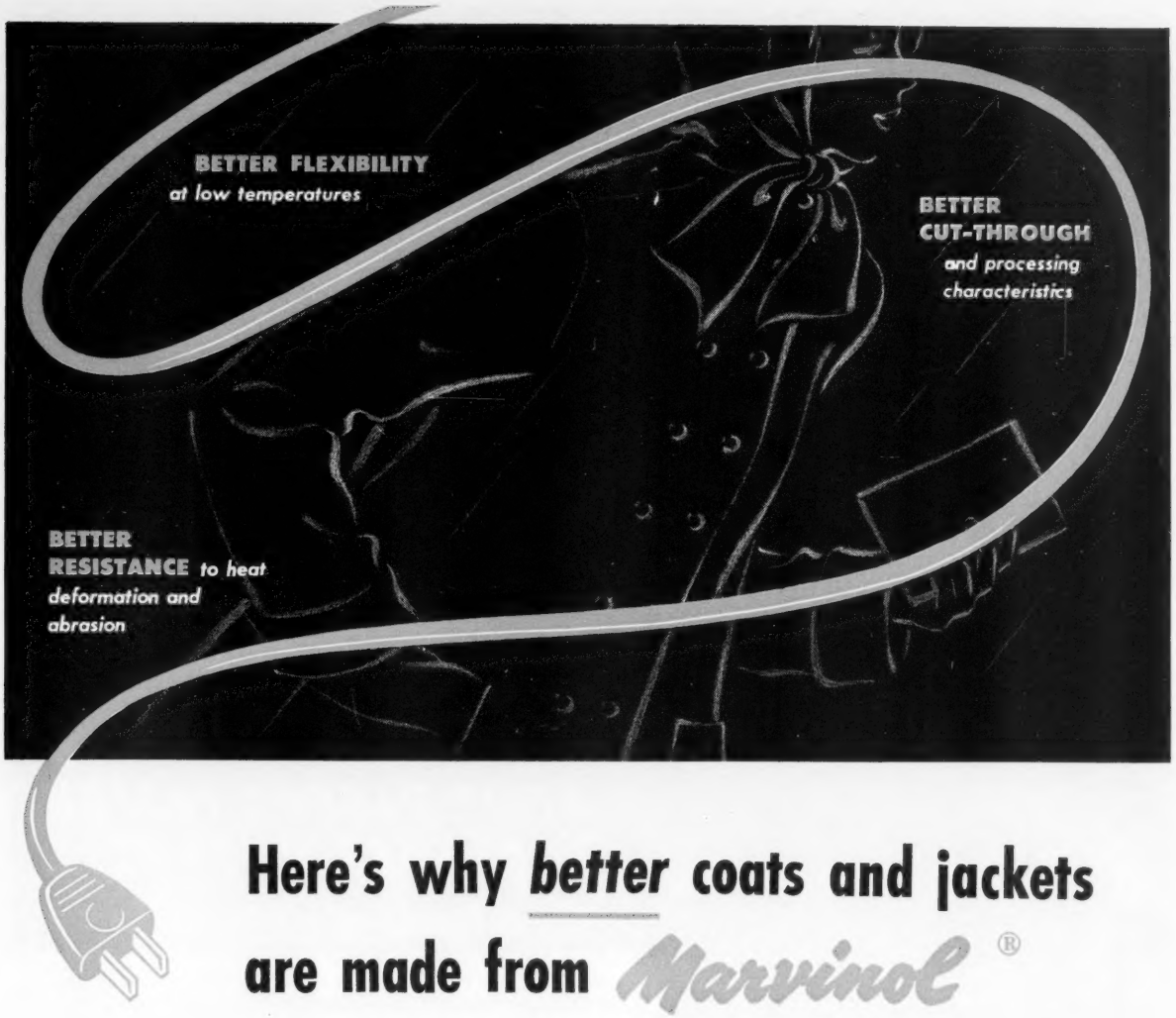
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM WIRE ★

WIRE & WIRE PRODUCTS, Vol. 24, No. 7, July, 1949. Publication Office, at One Sherman Ave., Jersey City 7, N. J. Executive Office, 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secy. and Treas. Subscription price: U. S. $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, January 10, 1949, at the Post Office, Jersey City, N. J., under Act of March 3, 1879.



Here's why *better* coats and jackets are made from Marvinol®

WHEN it comes to coating wire, Marvinol VR-10, a superior vinyl resin, offers you these many advantages. Marvinol coats and jackets are dry, tough, abrasion resistant. They're flexible always . . . even at low temperatures. They resist shrinkage and heat deformation because Marvinol gives them superior dimensional stability.

Marvinol plastics withstand the destructive forces of light, aging, oils, acids. They're waterproof, tear-resistant with better cut-through.

In processing, Marvinol can reduce your costs through time savings on pre-mix, Banbury and open mill stages. Marvinol offers possibilities for faster extrusion cycles.

If you do not do your own compounding, let us show you how you can save money by performing this stage right in your own plant.

The Glenn L. Martin Company makes and sells Marvinol vinyl resin as a raw material to processors. It compounds and fabricates *only* in modern customer service laboratories for *your* benefit. So if you *make* coats and jackets for wire and want information . . . or if you *use* coated wire and want the name of someone now coating wire with Marvinol, write to Chemicals Div., Dept. W-7, The Glenn L. Martin Company, Baltimore 3, Maryland.

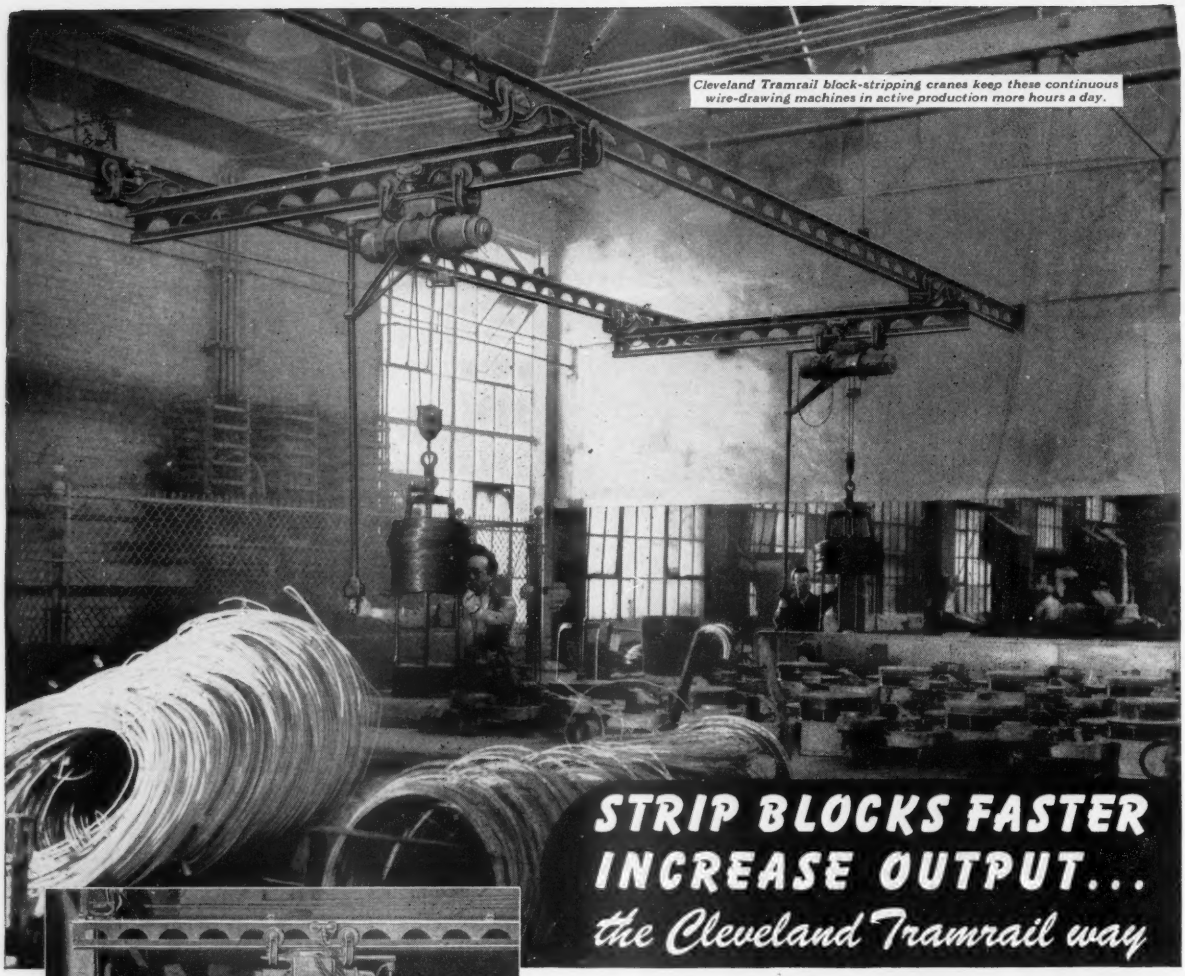
MANUFACTURERS OF: Dependable Martin 2-0-2 airliners • Advanced military aircraft • Revolutionary rockets and missiles • Electronic fire control systems • Versatile Marvinol resins (Martin Chemicals Division) • **DEVELOPERS OF:** Mareng fuel tanks (licensed to U. S. Rubber Co.) • Stratovision aerial re-broadcasting (in conjunction with Westinghouse Electric Corp.) • Honeycomb construction material (licensed to U. S. Plywood Corp.) • New type hydraulic automotive and aircraft brake • Permanent fabric flameproofing •
LEADERS IN RESEARCH to guard the peace and build better living in many far-reaching fields.

Martin® Marvinol

RESINS, PLASTICIZERS AND STABILIZERS PRODUCED BY THE CHEMICALS DIVISION OF

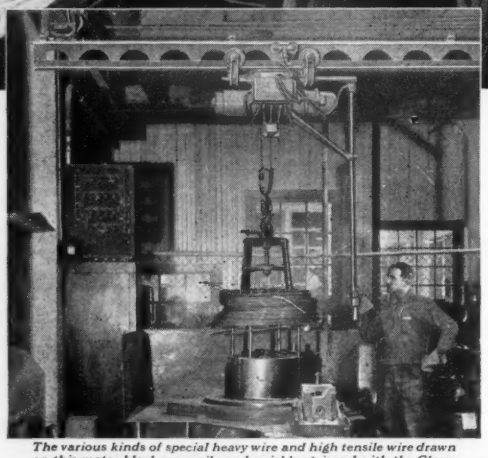
THE GLENN L. MARTIN COMPANY • AN INTERNATIONAL INSTITUTION

"BETTER PRODUCTS, GREATER PROGRESS, ARE MADE BY MARTIN."



Cleveland Tramrail block-stripping cranes keep these continuous wire-drawing machines in active production more hours a day.

STRIP BLOCKS FASTER INCREASE OUTPUT... *the Cleveland Tramrail way*



The various kinds of special heavy wire and high tensile wire drawn on this motor block are easily and quickly stripped with the Cleveland Tramrail crane.

Many mills in the United States and Canada have installations of Cleveland Tramrail block-stripping cranes and carriers. They are stripping draw blocks faster and keeping them in operation more hours a day, thus stepping up output.

Smooth rolling Cleveland Tramrail equipment has been especially designed for this service. It allows a man to take care of more blocks and draw heavier bundles. Older experienced men can usually keep pace with younger fellows when this equipment is provided.

The equipment consists of a hand-propelled crane or carrier with an electric hoist. The crane or carrier is easily pushed on its ball-bearing wheels by means of the rigid arm attached to the carrier. Push buttons, conveniently located in the handle at the lower end of the arm, control the hoist.

Cleveland Tramrail overhead materials handling equipment has been developed to serve every department in rod and wire mills.

GET THIS BOOK!

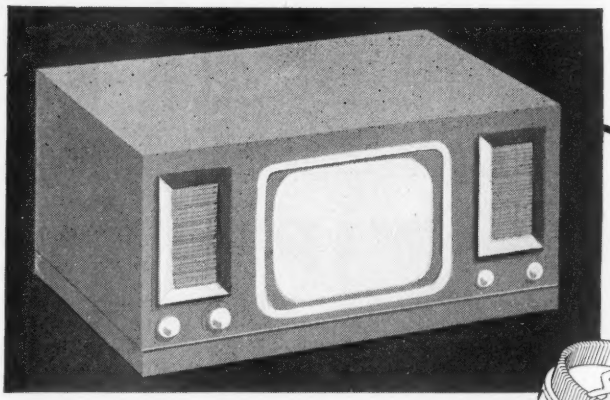
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
9201 EAST 288TH ST. WICKLIFFE, OHIO

CLEVELAND TRAMRAIL

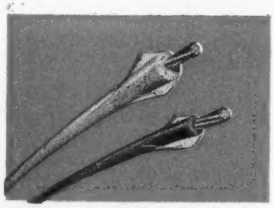
OVERHEAD MATERIALS HANDLING EQUIPMENT

Hook-up wire jacketed with HEAT-RESISTANT DU PONT NYLON PLASTIC approved for temperatures to 90°C.

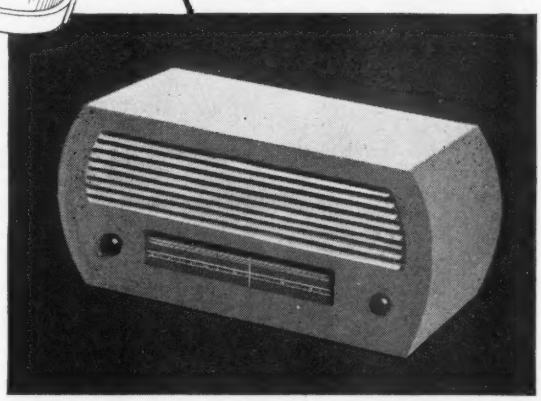


NEW NYLON-JACKETED WIRE

for Radio, Electrical and Electronic Devices



HEAT-RESISTANT nylon-jacketed wire, made by Gavitt Manufacturing Co., Brookfield, Mass., in two types: 1/64″ wall thickness with 300-volt rating, and 1/32″ wall thickness with 600-volt rating—both with 5-mil extruded nylon jackets.



Small diameter, light weight, and flexibility among the many *extra* advantages of nylon heat-resistant jackets

The first thermoplastic-insulated wire to receive Underwriters' approval for use in electrical appliances at temperatures to 90°C. is now being made by covering the wire with a jacket of Du Pont nylon plastic.

Only a thin coating of lightweight nylon is needed to provide this added heat-resistance, instead of the heavy asbestos jacket formerly used. Thus this wire has the advantages of *light weight, small diameter,* and *flexibility.*

And in addition to raising the heat-resistance of the primary insulation, nylon provides improved resistance to oils, chemicals, and abrasion . . . plus *extra smoothness* for easier pulling.

To help you make better products

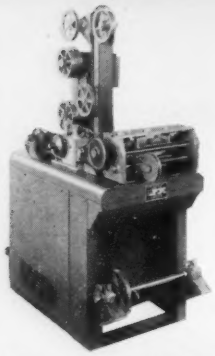
Today, manufacturers of electrical wire are finding that a jacket of nylon reduces deformation under load at elevated temperatures, and they are using this property to help meet the increasing demand for heat-resistant wiring. Nylon can help you make many electrical products better. This Du Pont plastic can be extruded over bare wire or over primary insulation. It can be molded into thin sections and intricate shapes, and around metal inserts.

How can you take advantage of its unusual properties? To see how other manufacturers are using nylon profitably, and for valuable information on molding and extrusion of nylon, write for free booklets.

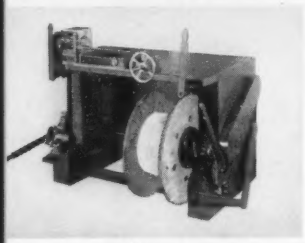
E. I. du Pont de Nemours & Co. (Inc.), Plastics Department.

MAIN SALES OFFICES: 350 Fifth Avenue, New York 1, N. Y.; 7 So. Dearborn Street, Chicago 3, Illinois; 845 E. 60th Street, Los Angeles 1, California.

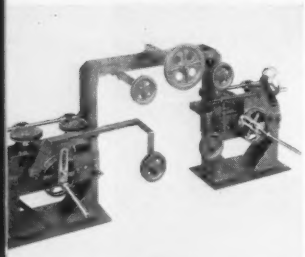
DU PONT
REG. U.S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY



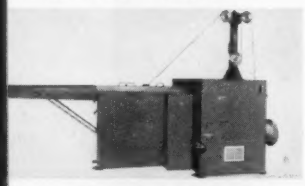
SINGLE REEL TAKEUPS



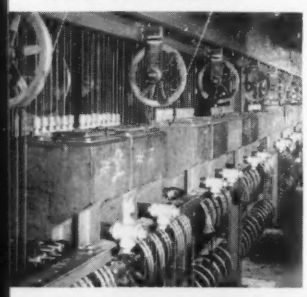
CONTINUOUS TAKEUP



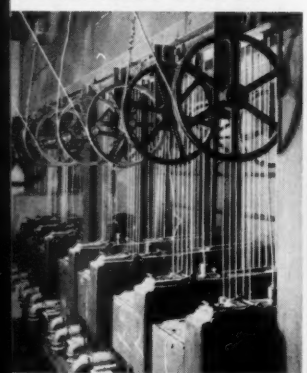
LETOFF STAND



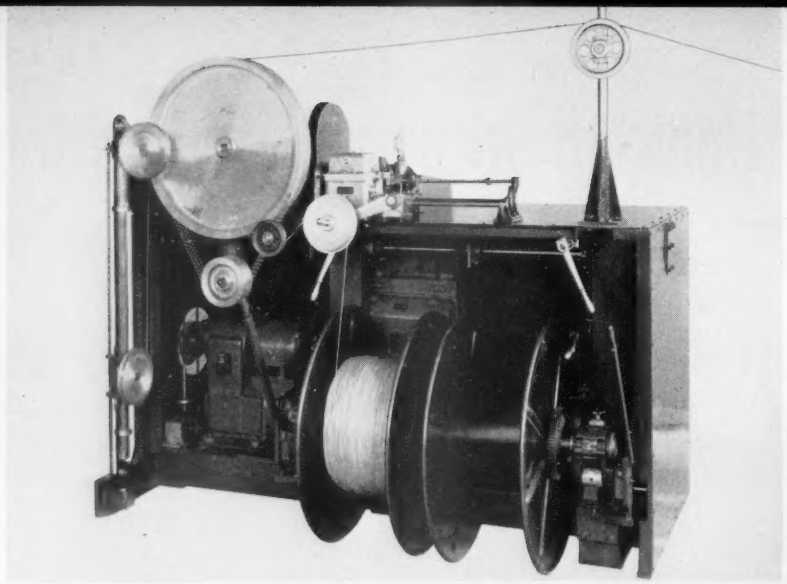
TUBING TAKEUP



LACQUERING SYSTEM



LACQUERING SYSTEM



CONTINUOUS TAKEUP WITH INTEGRAL CAPSTAN

INSULATED WIRE MACHINERY

EXTRUSION SYSTEMS

CONTINUOUS TAKEUPS	CORD PRE-DRYERS
LACQUERING SYSTEMS	ENAMELING MACHINES
PROCESS ANNEALERS	DRAW BENCH TAKEUPS

ASBESTOS INSULATING MACHINES

SATURATING AND FINISHING SYSTEMS

● IOI Equipment is used in the largest Wire Mills in the world. If you have a problem in this field it will pay you to consult IOI. Write for complete information.

INDUSTRIAL OVENS, INC.

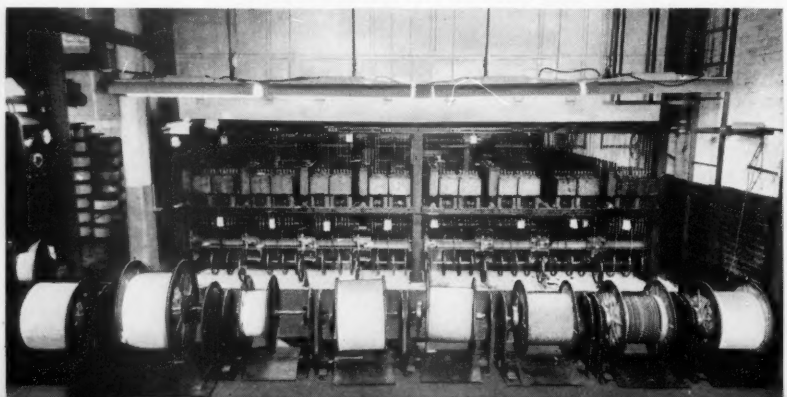
13825 TRISKETT ROAD — CLEVELAND 11, OHIO

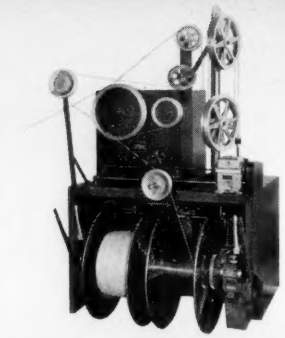
ASSOCIATED COMPANY• JAMES DAY MACHINERY LTD., LONDON, W. 1, ENGLAND

COOLING TROUGH

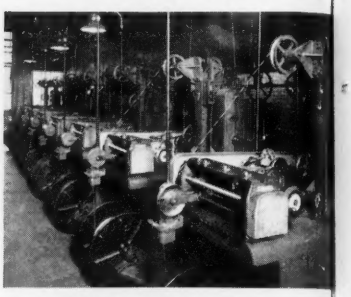
COOLING TROUGH

CABLE LACQUERING SYSTEM

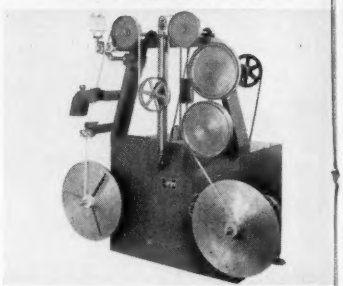




DUAL REEL TAKEUP

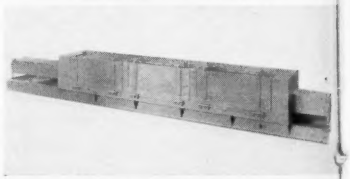


SINGLE REEL TAKEUP

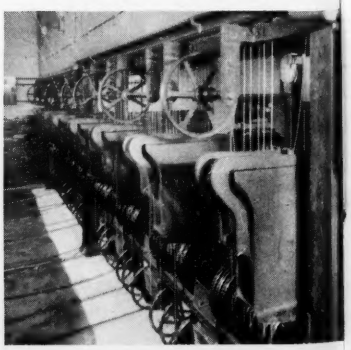


STRIP TAKEUP

PAYOFF STANDS



WIRE PRE-ANNEALER



LACQUERING SYSTEM

give weather the brush-off!

WITH ALCOA ALUMINUM WIRE

Your customers will never see red rust on wire articles fabricated from Alcoa Aluminum Wire. In most cases, the natural-bright finish of aluminum needs no painting or plating for protection. Or pick any color of the rainbow . . . patented Alumilite process puts that color into the aluminum surface—puts it there for keeps.

Customers like the lighter weight of aluminum wire goods, too. Aluminum's light weight—⅓ that of steel or brass—gives you 3 times as many feet of wire stock per pound of metal, cuts the cost of fabricated goods. What's more, Alcoa Wire handles well on your present equipment. You can weld it or braze it for strong, tight joints. Alcoa Aluminum Wire is made in various shapes and sizes, in a variety of alloys and tempers. ALUMINUM COMPANY OF AMERICA, 1828 Gulf Building, Pittsburgh 19, Pennsylvania.

Send for copies of "Alcoa Aluminum and Its Alloys", complete information and data on all Alcoa Aluminum Alloys, plus 64-page, four-color booklet, "Finishes for Alcoa Aluminum".

ALCOA FIRST IN ALUMINUM

REG. U. S. PAT. OFF.

HUDSON WIRE COMPANY

PRODUCERS OF FINE WIRES IN ALL METALS

FINE BARE WIRES

High Brass, Low Brass, Zinc 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver Plated Copper, False Gold and Copper.

Cadmium, Nickel Silver (10%, 18%, 30%), Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification, Metallic Fibre for Packing Purposes, Copper, Bronze, Zinc, Lead and Aluminum.

WIRES FOR METAL SPRAYING

Pure Lead, Lead Alloys, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire, High Conductivity Electric Wire.

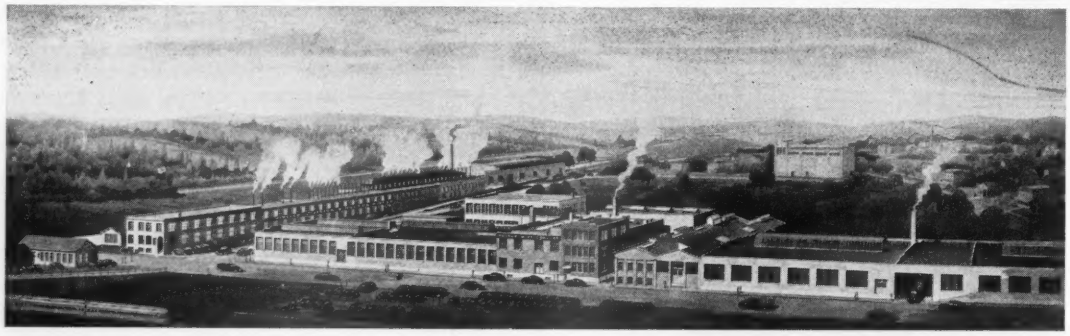
Cadmium, Nickel Silver (10%, 18%, 30%), Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze.

Look for the name — **HUDCO** — A guarantee of quality

"HUDCO" specially processed Copper Wire for enamelling purposes is drawn from Selected Copper, insuring the maximum conductivity. This is but one example of the use of the most advanced and approved materials and methods in our processing.

BETTER WIRE AT LOWER COST

Write for Prices and Samples • Let Us Quote on Your Requirements

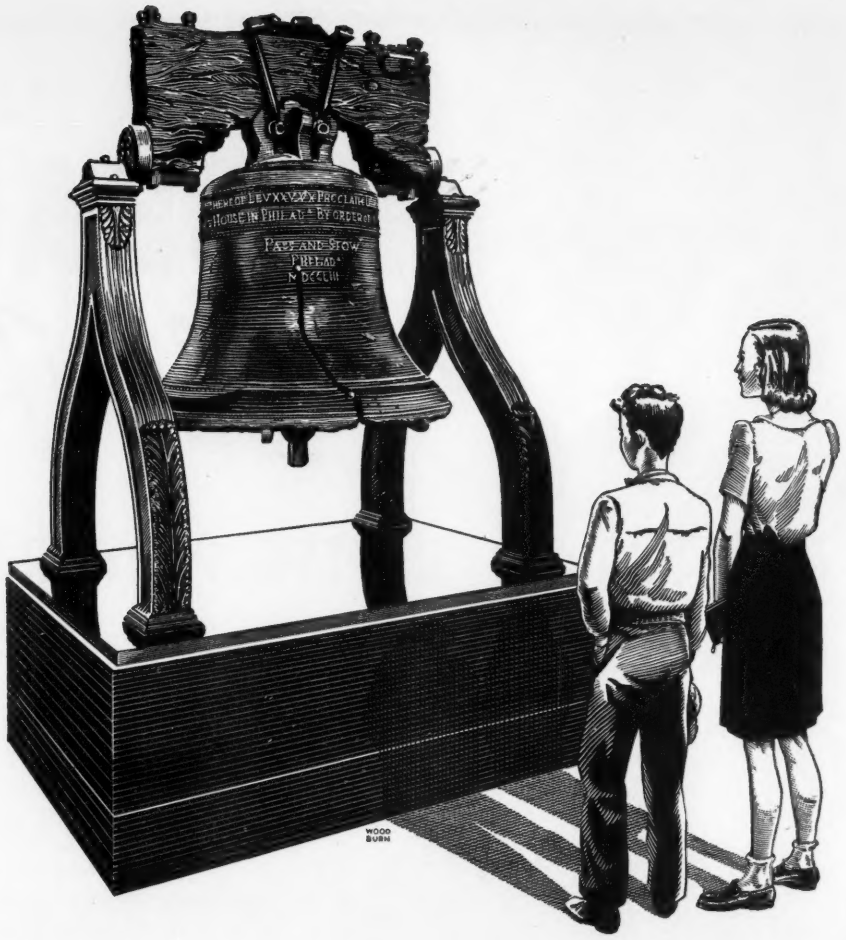


"HUDCO" PLANT AT OSSINING, NEW YORK

HUDSON WIRE COMPANY

Established in 1902 — Successors to Royle & Akin

OSSINING, NEW YORK



What price liberty?

IT was Daniel Webster who said, "God grants liberty only to those who love it and are always ready to guard and defend it."

Today in our yearning for "security", we are inclined to forget about that "liberty" for which this old bell rang out. The two are not synonymous. When we permit a benevolent government to assume more and more responsibility for housing, feeding, hospitalizing, and even entertaining our citizens, we must in return expect to surrender more and more of our personal rights and liberties.

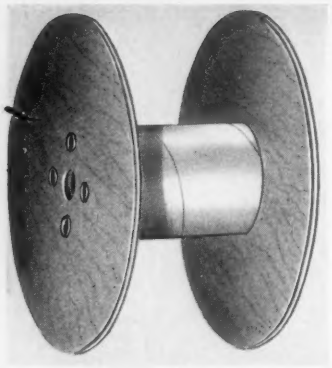
Actually, the only security any man can enjoy with liberty is the security he earns through his own initiative, resourcefulness and productivity. As community leaders, it is our responsibility to help our fellow citizens realize that for the delusion of government-guaranteed security they are sacrificing liberty.

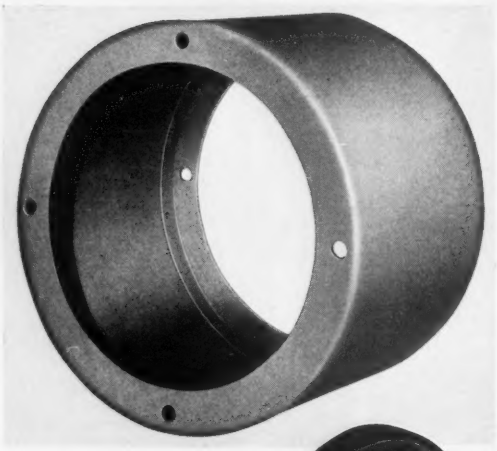
The Youngstown Sheet and Tube Company

General Offices -- Youngstown 1, Ohio
Export Offices -- 500 Fifth Avenue, New York

MANUFACTURERS OF CARBON, ALLOY AND YOLOY STEELS

ELECTROLYTIC TIN PLATE - COKE TIN PLATE - WIRE - COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - RAILROAD TRACK SPIKES.



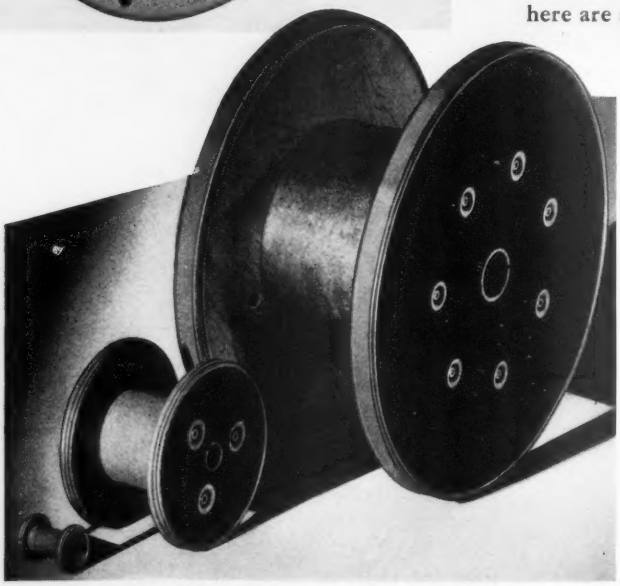


HUBBARD *Spools and Reels*

BETTER PERFORMANCE

The exact balance of Hubbard spools and reels assures freedom from wire breakage at the new high speeds . . . and the other Hubbard qualities of rugged construction, minimum weight and low cost add up to highest overall spool performance in the wire industry.

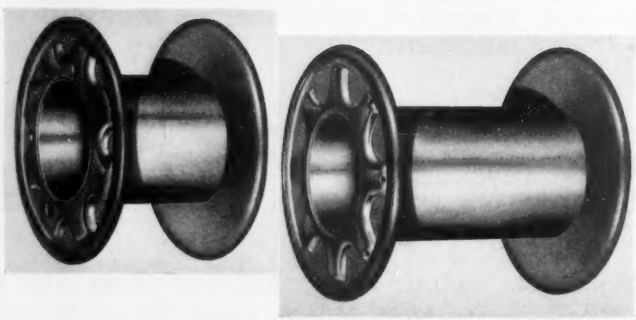
There is a size and type for every wire mill need. Shown here are a few of the many:



1. Lightweight Reels. Ideal (no return) for shipping many types of wire.
2. Steel Double-Strength Traverse. New in 1948. Double thickness flange and shoulder gives minimum weight with maximum strength where needed.
3. Metal Bound Spools and Reels for Shipping. Head of bonded plywood with die formed steel tire. For light weight and long wear.
4. Steel Process Spools. New in 1948. Steel washer design for greatest rigidity. All joints brazed and smooth finished. For all wire drawing and processing operations . . . especially recommended for handling fine wire. Built in all standard sizes.

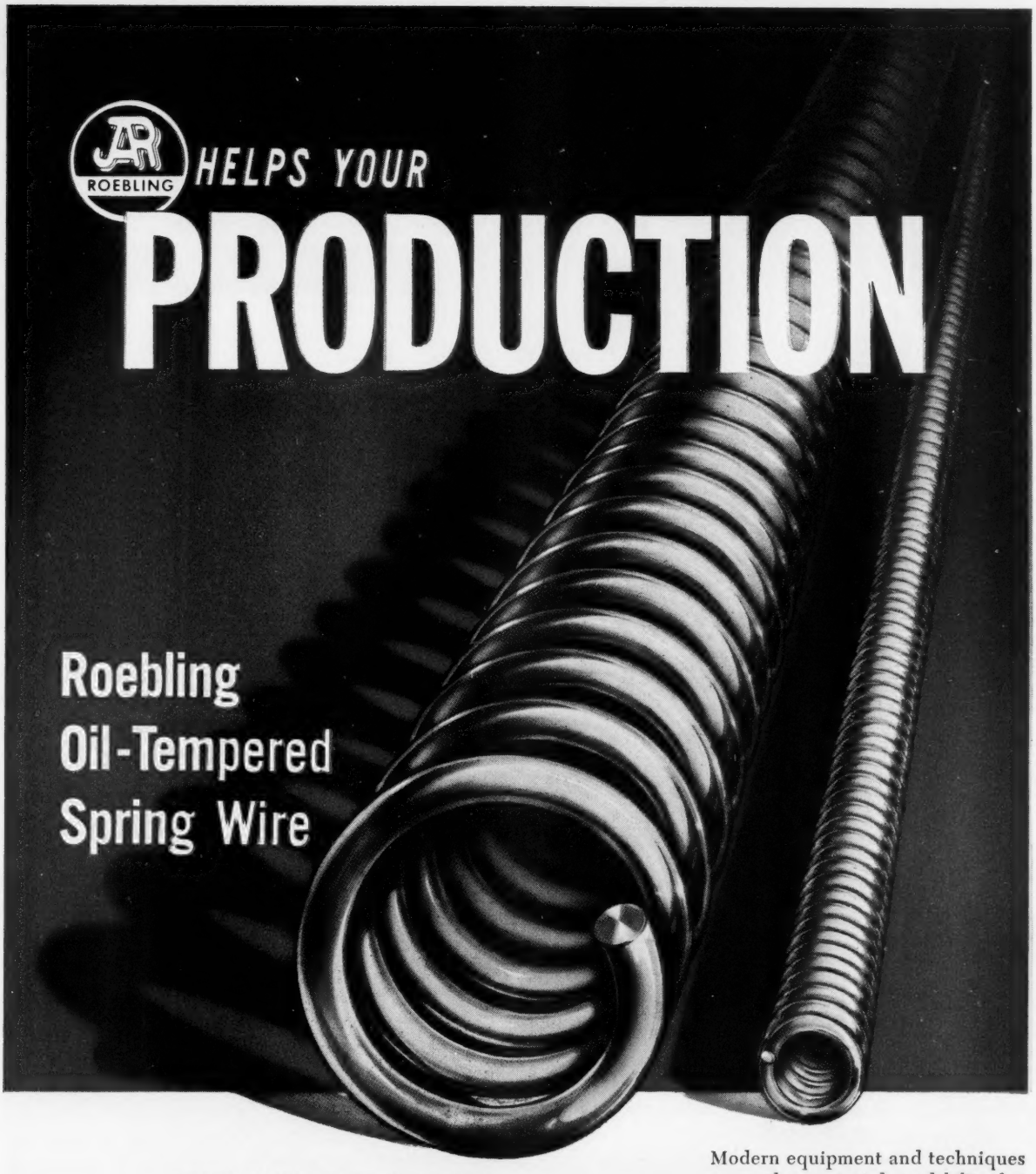
For information on Hubbard spools, reels and traverses, write

HUBBARD SPOOL COMPANY
1624 Carroll Avenue • Chicago 12, Illinois



Hubbard

STEEL SPOOLS AND REELS . . . METAL BOUND SPOOLS AND REELS . . . STEEL TRAVERSES LIGHT WEIGHT REELS . . . WOOD REELS



YOU CAN GET IT NOW!

YOU'LL CUT DOWN machine stoppages and minimize rejects with Roebling Oil-Tempered Spring Wire. This wire is a *quality* product. Every inch is identical in gauge and finish... uniformly up to snuff in mechanical and metallurgical properties.

Roebling Oil-Tempered Spring Wire is available now. Roebling has developed one of the largest wire mills in the country for making specialty wires. From making the steel to the finished product, every manufacturing phase is performed in Roebling's own plants. Modern equipment and techniques assure the constant dependability that has earned Roebling a century of confidence.

Your Roebling Field Man will gladly help you choose the best wire—round, flat or shaped—for utmost efficiency and economy in your products. John A. Roebling's Sons Company, Trenton 2, New Jersey.

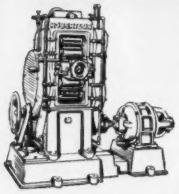
WRITE OR CALL THE ROEBLING FIELD MAN AT YOUR NEAREST ROEBLING OFFICE AND WAREHOUSE

Atlanta, 934 Avon Ave. ★ *Boston*, 51 Sleeper St. ★ *Chicago*, 5525 W. Roosevelt Rd. ★ *Cleveland*, 701 St. Clair Ave., N. E. ★ *Denver*, 1635 17th St. ★ *Houston*, 6216 Navigation Blvd. ★ *Los Angeles*, 216 S. Alameda St. ★ *New York*, 19 Rector St. ★ *Philadelphia*, 12 S. 12th St. ★ *Pittsburgh*, 855 W. North Ave. ★ *Portland, Ore.*, 1032 N. W. 14th Ave. ★ *San Francisco*, 1740 17th St. ★ *Seattle*, 900 First Ave.

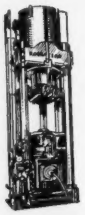
ROEBLING

☆ A CENTURY OF CONFIDENCE ☆

A PIONEER & LEADER
FOR OVER 90 YEARS



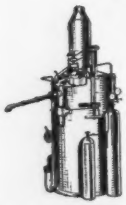
Lead Sheath Stripping Machine



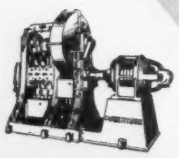
Cable Lead Encasing Press

JOHN Robertson
COMPANY, INCORPORATED

121-137 WATER STREET
BROOKLYN 1, NEW YORK

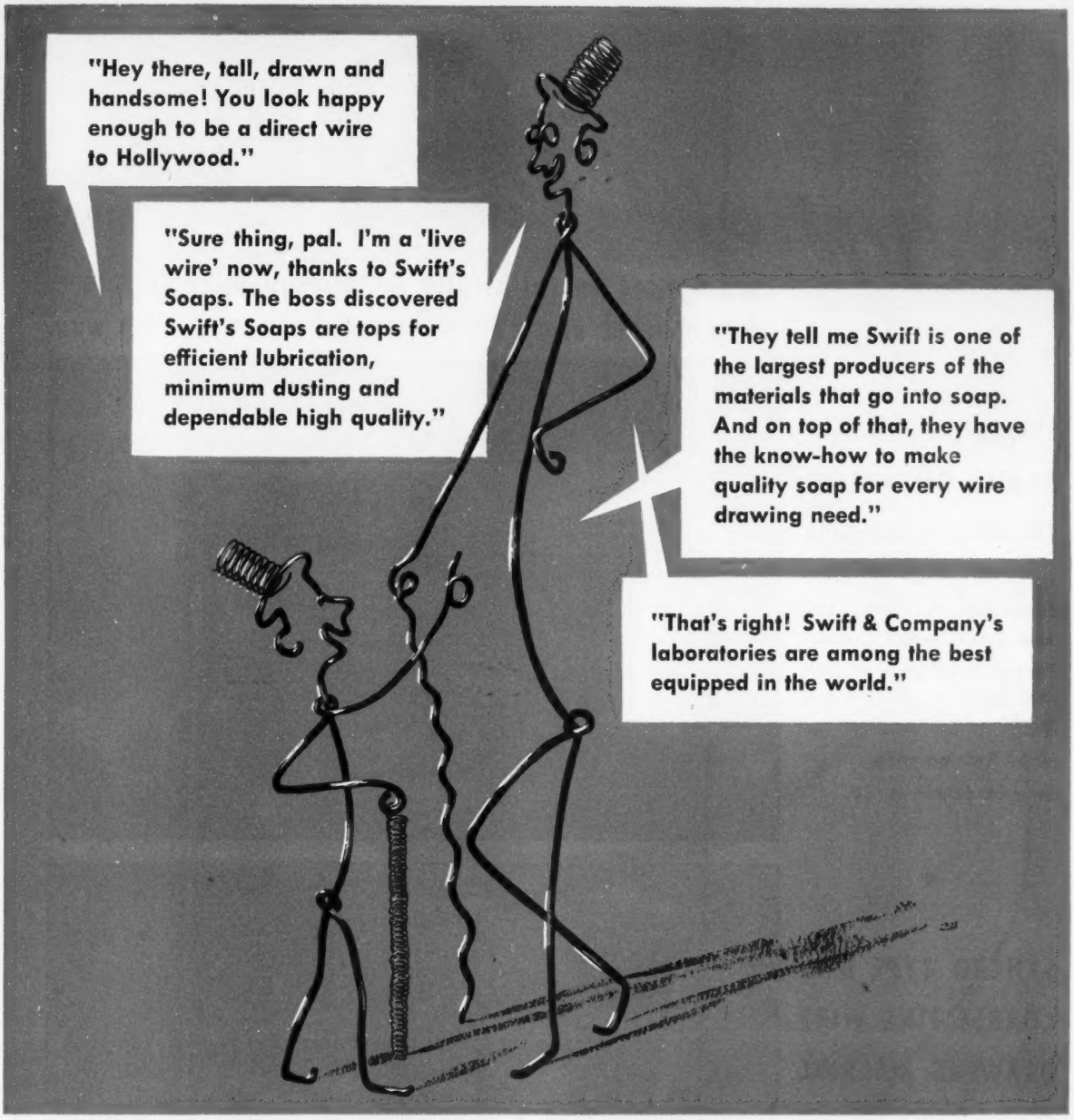


Closed Lead Melting Pot



High Pressure Hydraulic Pump

Designers and builders of Hydraulic Equipment, including Extrusion Presses, Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, Lead Sheath Stripping Machines, and Special Equipment for Special Uses . . . We suggest you write for descriptive literature.


"Hey there, tall, drawn and handsome! You look happy enough to be a direct wire to Hollywood."
"Sure thing, pal. I'm a 'live wire' now, thanks to Swift's Soaps. The boss discovered Swift's Soaps are tops for efficient lubrication, minimum dusting and dependable high quality."
"They tell me Swift is one of the largest producers of the materials that go into soap. And on top of that, they have the know-how to make quality soap for every wire drawing need."
"That's right! Swift & Company's laboratories are among the best equipped in the world."

There's a Swift Distribution Point near you... to give you fast, efficient service.

Call on Swift for

Powdered White Ribbon
Guaranteed Powder
Snap Heavy Duty Wire Drawing Powder No. 282
No. 559 Powdered Soap

In barrels and bags

Swift's Soaps

for every wire drawing operation

Swift & Company SOAP DEPARTMENT, CHICAGO 9, ILLINOIS

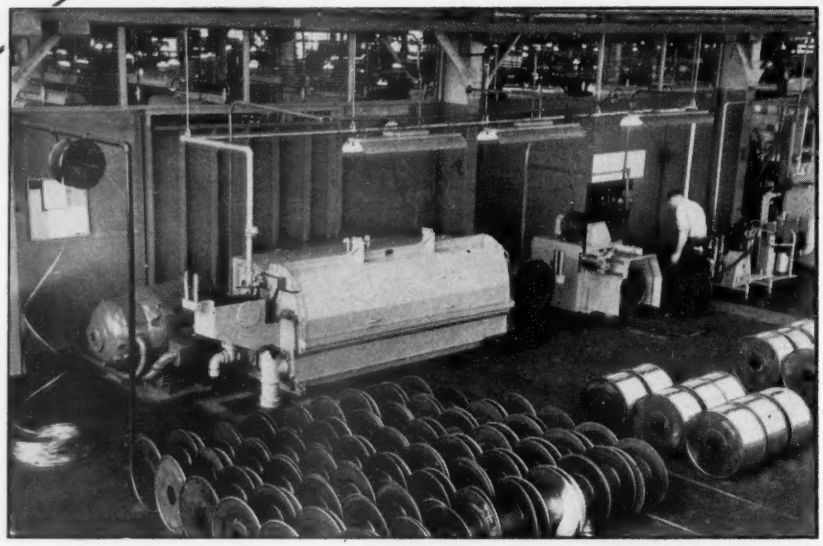
Syncro in Action

Two Syncro installations in leading wire plants — taking care of every drawing need from rod to fine wire.

SYNCRO TYPE F-13 HEAVY DUTY ROD BREAKDOWN MACHINE

Draws all non-ferrous metals. Produces clean, unmarked wire. Maximum size of entering rod ⅜". Size of finished wire # 4 to # 14 B & S Gauge. A compact unit for direct floor mounting.

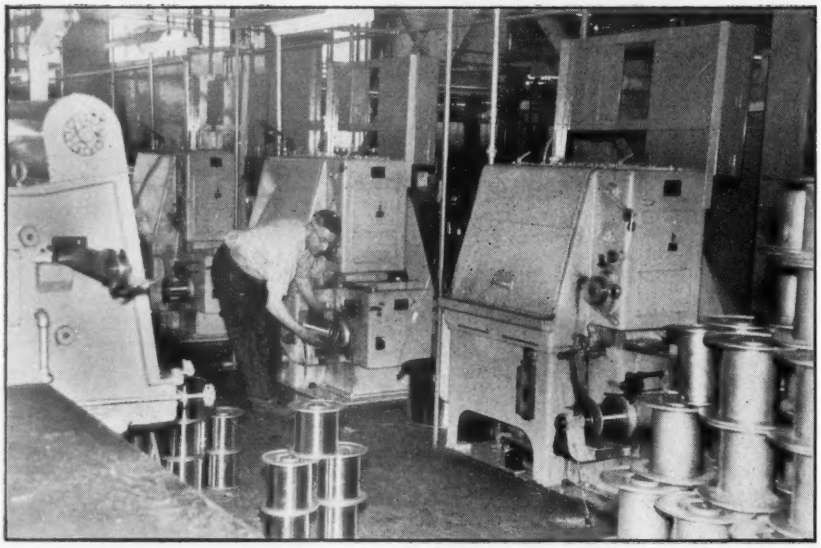
Send for Bulletin #100.



SYNCRO TYPE B-16 COARSE FINE WIRE DRAWING MACHINE

Two models, expanding arbor and outboard type arbor. Maximum size of entering wire .06408" (#14 B & S Gauge). Finished wire range #26 to #34 B & S Gauge.

Write for Bulletin #115.



SYNCRO MACHINE COMPANY

611 Sayre Avenue — Perth Amboy, N. J.

Affiliated Company

Winget-Syncro, Rochester, Kent, England

look at wire through the consumer's eyes

What does he see? The consumer sees wire products in terms of attractive appearance, service life and economy —and he wants the best. He knows that no other metal can match the combination of advantages offered by stainless steel.

ARMCO Stainless has gleaming beauty, rust-resistance, great strength, heat-resistance, and is easy to keep clean. Consumers also find that stainless wire products are economical in the long run because they assure trouble-free service life. There is no plating to chip or wear off this solid rustless metal.

There are also important advantages for you in fabricating ARMCO Stainless Steel Wire. In many cases stainless actually costs less, because expensive plating processes are eliminated. And the excellent sales appeal of stainless steel means more business for you.

Best of all, ARMCO Stainless Steel wire may be redrawn, formed, cold-headed, swaged, or hot-upset with the same equipment used for ordinary metals.

Every time you have an opportunity why not recommend switching regular wire products to stainless steel? It may mean more profit for you. And when you need stainless, write us to call your nearest Armco district office. Armco Steel Corporation, 2999 Curtis Street, Middletown, Ohio. Export: The Armco International Corporation.

ARMCO STAINLESS STEEL WIRE ARMCO

A REPUTATION HANGS-

ON MILLIONS OF THESE

CONTINENTAL STEEL CORP. STEEL CONTINENTAL WIRE KOKOMO, IND.

● Have you ever cursed a flimsy coat hanger? Then you can appreciate why so commonplace an item as a wire hanger is of critical importance to one of our customers. This particular manufacturer uses Continental Steel wire to make millions of coat hangers. His reputation—and ours—literally hang by this wire! We feel, therefore, the greatest responsibility toward our customer and his wire-fabricating problems.

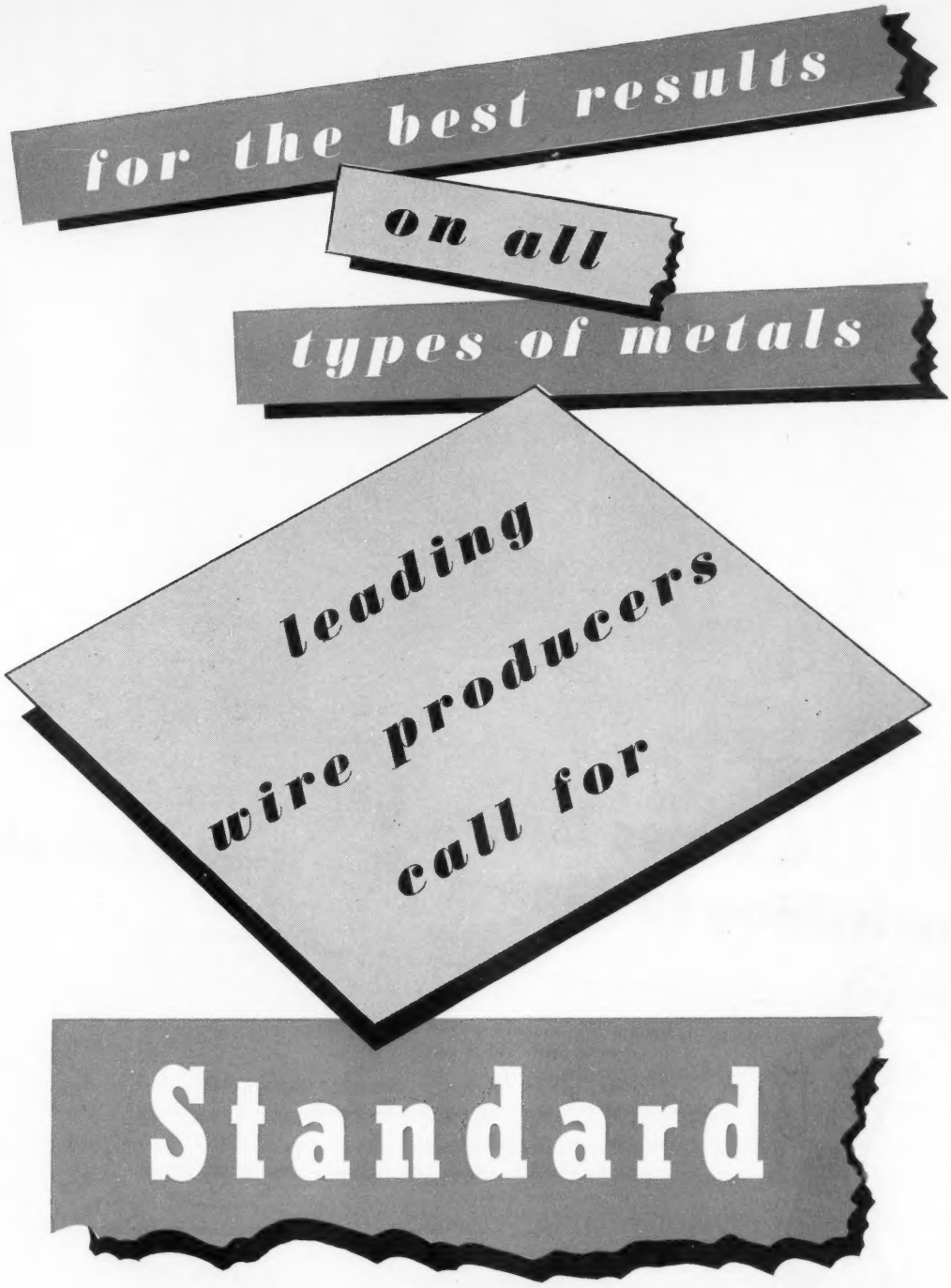
There is this kind of "family" relationship between Continental and the hundreds of manufacturers we supply . . . whether they make coat hangers, fish hooks or gear shift rods. We act in the belief that business success ultimately depends on SERVICE . . . so you'll always find us ready and willing to help you. If you are troubled by a particular wire fabrication problem, please feel free to write us, without obligation.

CONTINENTAL STEEL

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF *Manufacturer's Wire* in many sizes, shapes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.



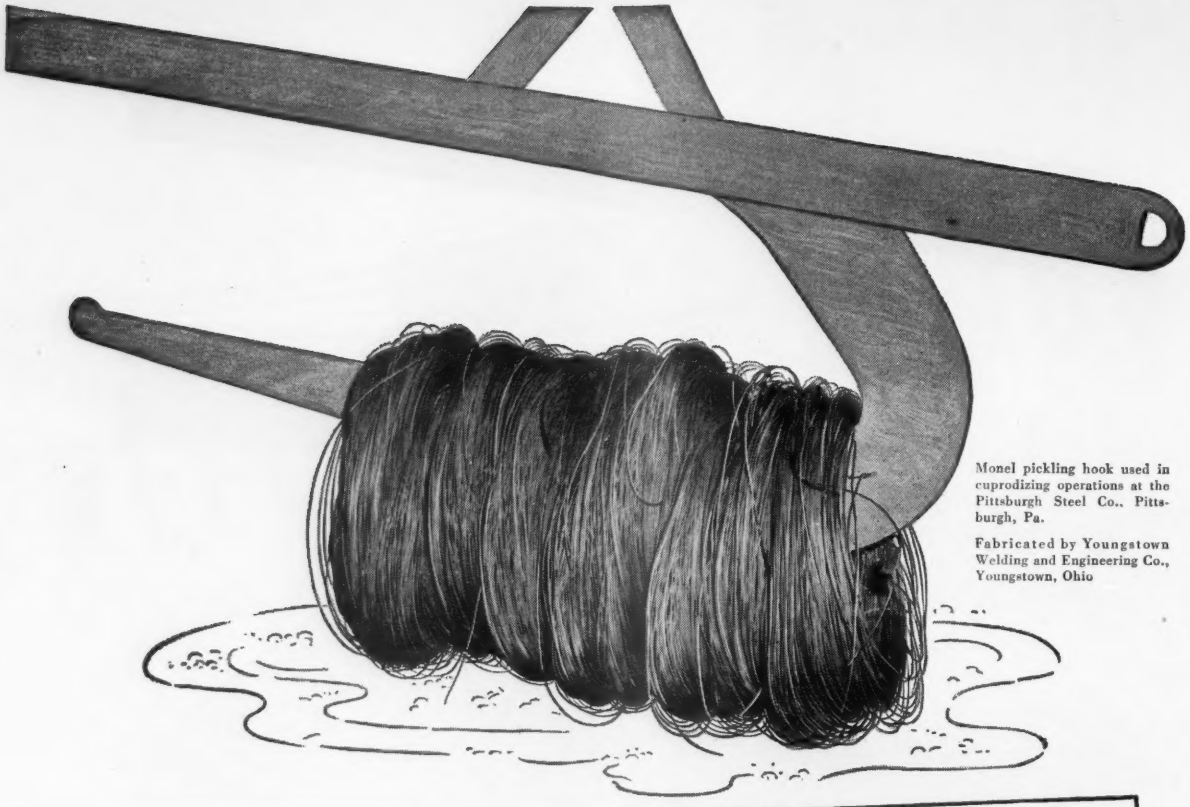
Call or Write Headquarters or Any Standard Service Center:

INDUSTRIAL COMPOUNDS CO.
C. R. Mehl, President
2037 Sacramento Blvd.
Los Angeles 21, California

INDUSTRIAL COMPOUNDS CO.
C. R. Mehl, President
2425 Seventeenth Street
San Francisco, California

STANDARD INDUSTRIAL COMPOUNDS COMPANY
William Kinnery
Millbury, Massachusetts

wire drawing lubricants *Standard* INDUSTRIAL COMPOUNDS CO., INC.
4600 WEST FERDINAND STREET
CHICAGO 44, ILLINOIS



Monel pickling hook used in cuprodizing operations at the Pittsburgh Steel Co., Pittsburgh, Pa.

Fabricated by Youngstown Welding and Engineering Co., Youngstown, Ohio

6 times longer life since switching to "Monel" Pickling Hooks!

Longer life is an old story to users of Monel* pickling equipment, **(over 40 years old in fact.)**

Pittsburgh Steel Company, too, found that out when they installed Monel pickling hooks to handle coils of steel wire.

Before turning to Monel, hooks of other materials had been tried. *Sulfuric acid and wire-coating chemicals ruined all of them within seven months!*

The Monel hooks, however, ended that problem. So far, they have outlasted the best of the others by six times, and are still in service after 3½ years.

Today, at Pittsburgh Steel, 14 Monel hooks are in operation, each handling payloads up to 2400 pounds.

"PICK" MONEL *for all types of pickling equipment. It can be fabricated to your needs out of economical, standard mill forms. For more information on Monel and Monel fabricators, write our Ray Reddell.*

*Reg. U. S. Pat. Off.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall St., New York 5, N. Y.

DESIGNERS and MANUFACTURERS! Sand castings and precision castings of Monel, Nickel, Inconel and other Nickel alloys are available from Inco's own foundry.

EMBLEM OF SERVICE
INCO
TRADE MARK

"MONEL*" Pickling Equipment means *Extra CAPACITY . . . Extra LIFE . . . Extra SAFETY*

UPRIGHT ★ ★ ★

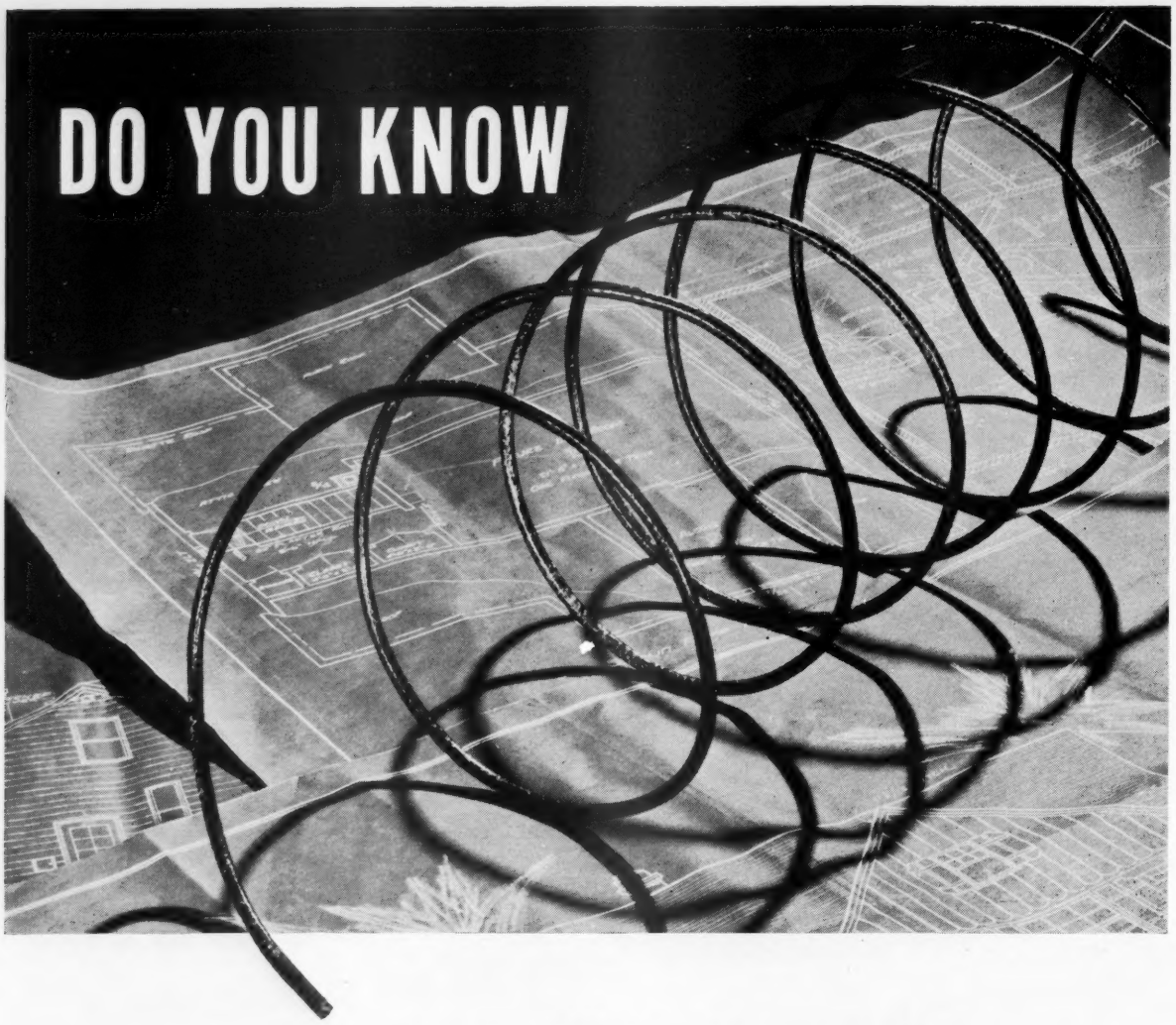
★ ★ ★ CONE

Wire Drawing & Machines

FOUNDED WATERBURY FARREL 1851

THESE high speed machines are available in several sizes and can be had with either a coiling block or spooler. The spooler may be an attachment or a separate floor-type device, such as shown. This is the No. 4 machine with belt-type cradle spooler. It is driven by a direct-coupled motor (not shown), has 13 dies and capacity for drawing copper from ¼" maximum starting size down to a finishing size of from No. 10 to No. 18 B. & S. gage. The dies and the hardened steel drawing rolls are enclosed by a rolling steel curtain to confine the splash of the drawing lubricant.

WATERBURY-FARREL
FOUNDRY & MACHINE COMPANY
Waterbury, Connecticut, U. S. A.
SALES OFFICES: CHICAGO CLEVELAND NEWARK, N. J.



...WHY FIBERGLAS* 150's YARNS ARE USED IN SINGLE CONDUCTOR BUILDING WIRE?

1. Permanence.
2. Low Cost.
3. Good Yarn Application Efficiency.
4. Better Space Factor.

For complete information about Fiberglas yarns, for this and other electrical uses, write Owens-Corning Fiberglas Corporation, Textile Products Division, Dept. 875, 16 East 56th Street, New York 22.

In Canada: Fiberglas Canada Ltd., Toronto, Ontario

OWENS-CORNING FIBERGLAS Yarns

T.M. REG. U.S. PAT. OFF.

*FIBERGLAS is the trade-mark (Reg.U.S.Pat.Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

R-166

- Improved round die design for wire, bar and tubing
- Improved forged steel casings for greater strength and tighter grip on nibs
- Improved carbides for longer die life and increased production
- Immediate deliveries; practically all sizes of round dies now available from stock

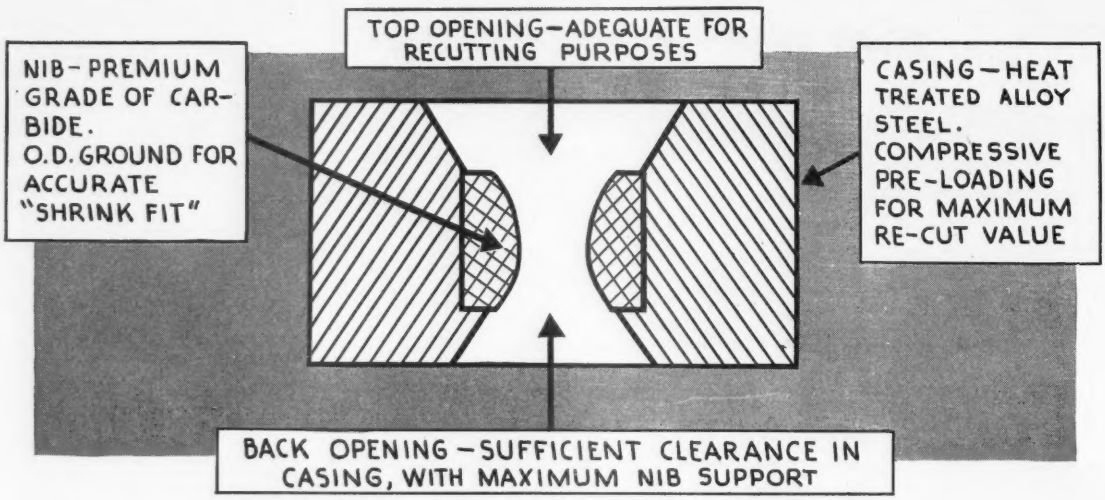
Call **Firth-Sterling**

STEEL & CARBIDE CORPORATION

McKEESPORT, PA.

Offices and warehouses in Hartford, Philadelphia, Cleveland, Detroit, Chicago, Dayton and Los Angeles. Offices in New York and Pittsburgh.
In Canada: Chapat Engineering & Sales, Ltd., Hamilton, Ontario

Our Constant Efforts to Engineer Better Dies For Wire Mills Have Produced Some Notable Improvements . . . At Present Our Dies Incorporate Several New Features of Design That Have Resulted in Improved Performance.


TOP OPENING—ADEQUATE FOR RECUTTING PURPOSES
NIB—PREMIUM GRADE OF CARBIDE. O.D. GROUND FOR ACCURATE "SHRINK FIT"
CASING—HEAT TREATED ALLOY STEEL. COMPRESSIVE PRE-LOADING FOR MAXIMUM RE-CUT VALUE
BACK OPENING—SUFFICIENT CLEARANCE IN CASING, WITH MAXIMUM NIB SUPPORT

Finished dies -- any shape and all sizes -- with high "Hyprez" finish (black polish).

Rough drilled dies -- any shape and all sizes -- close to required size at low prices.

Rough cored dies -- Round hole only -- in standard rough cored hole sizes.

Direct Distributors of HYPREZ Diamond Compounds for *MODERN* Ripping and Polishing Practices with Superior Finish.

Eastern Distributors of WENDT-SONIS Carbide Cutting Tools.

Your inquiries are invited

EASTERN CARBIDE CORPORATION

Telephone: NEW ROCHELLE 2-6630

909 MAIN STREET NEW ROCHELLE, N. Y.

COMPLETE CARBIDE SALES AND SERVICE

SUL-COAT?

Shades of the Horse and Buggy!

EVERY *unnecessary operation* in your wire mill reflects itself in your cost per ton of wire drawn.

It is almost unbelievable that, in this era of the tungsten carbide die, the high-speed wire drawing machines, and Magnus Metalcoat #267, there are mills which *still* sul-coat their rod and wire... which not only sul-coat, but also bake their lime-coated rod for hours!

This is what we mean by *unnecessary operations.*

With Metalcoat #267, your cleaning and coating cycle is a matter of minutes... not hours... and your rod and wire are ready for the drawing machines.

Average drawing speeds of 1,000 feet per minute on rod, and 1,600 feet per minute on wire, are usual with Metalcoat #267.

In finished wire output, this really adds up to *tonnage!*

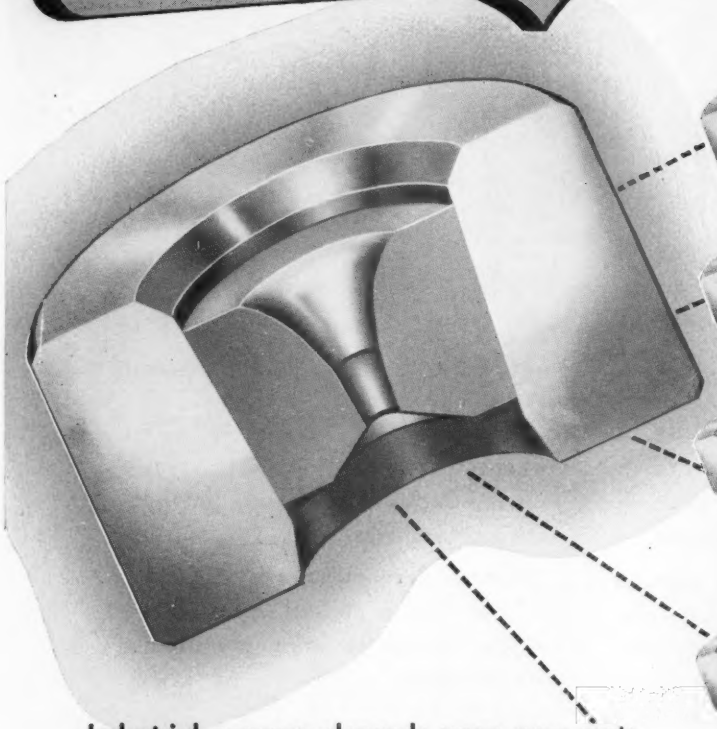
Why go through these extra operations, which only slow down production and add to your costs?

Have you tried Magnus Dri-Draw #6 yet? This is one of the finest wire drawing lubricants yet devised—a perfect combination with Metalcoat #267.

Have you asked for your copy of the new booklet on the use of Magnus Metalcoat #267? If not, write for your copy now.

MAGNUS CHEMICAL CO., INC.
Metal Coating Division
188 South Avenue Garwood, N. J.

NOT *One* but *Five* FIRSTS
make V-R Carbide Dies Foremost in industry!



First in producing the only Tantalum-Tungsten Carbide developed specifically for Drawing Dies.

First to develop extra wide tapered front and back openings for easy inspection and maintenance. No steel to cut when resizing or refinishing V-R Dies.

First to design and develop the tapered nib construction increasing internal strength and providing perfect die concentricity.

First to manufacture Carbide Die with preformed rough cored back relief to eliminate costly die room coring operations over the entire range of hole sizes.

First to furnish Carbide Dies rough cored to finish, at hole sizes below .015". These rough cored dies are available in dies sizes R-0, R-1, and R-3, rough cored at .004" and .010".

Industrial progress depends upon new materials, designs, developments, and services.

Vascoloy-Ramet furnishes them all Five with every V-R Carbide Die.

PHONE
Your Nearest V-R Branch Office for Your Carbide Die Needs Now!

V-R Carbide Tools - Blanks - Dies • Tantung Cast Alloy Tools - Precision Castings • Bulldog Toolholders - Blades - Inserts

V-R CARBIDE and TANTUNG

vascoloy-ramet corporation

WAUKEGAN • ILLINOIS

The Wire Outlook

Declining new order volume and heavy cancellations are reducing order backlogs for steel and the general opinion is that by August the industry will be operating at around 80% of capacity.

Up to recently the output of carbon steel had been well sustained, but this is beginning to taper off also. Some specialty steel interests have idle open hearths and electric furnace schedules, in many instances, are on 50% or smaller schedules.

Electric wire and cable plants have been largely in the doldrums for most of this year, although some are reporting signs of increased activity.

Much of the present quietness in business may be related to inventories and prices. As long as prices were advancing, buyers acquired larger stocks than needed and manufacturers, anticipating heavy demand, produced large stocks to meet it.

When the prices of basic supplies started to slide, both sides began to live on inventories and in many cases huge losses were written off on the price differentials between stocks on hand and the levels to which values had fallen. Wherever inventories have become exhausted, buying has started, but only on a hand-to-mouth basis. If and when prices show signs of stabilization, buying should resume and gradually approximate normal volumes.

There are many who believe that August and September will see the beginning of a sharp rise in business activity, while others, more pessimistic think the price readjustments to irreducible minimums will take the entire balance of the year.

Powerful props to the sustaining of business levels may come from military expenditures, ECA shipments abroad and the government's support of farm prices. While it may be argued that these artificial stimuli are not sound, they are positive factors with which business will be faced and their effect will undoubtedly be felt in the second half of 1949.

Certain it is, whichever school of thought is correct, the country's economy is returning to normal. Competition, the driving force of American industry, has come into play and out of the present painful readjustments should evolve a basis for good business of several years' duration.

Contributing to the recession trend is the labor outlook. Labor strife looms ahead, the result of demands that industry cannot well absorb under the circumstances. This creates an uncertainty for management that will continue until these matters are settled satisfactorily. Labor leaders would appear to be working against the best interests of union membership, but are under pressure to get more and give less, if they are to hold their stormy jobs.

Steel supply is no longer a problem. Copper, lead and zinc show signs of further declines, stainless steel uses are expanding and aluminum is well on the way to becoming more plentiful.

Wire for automotive uses is holding up better than most types, although some slackening has been noted here. The slump in manufacturers' wire continues, with most orders placed on a current fill-in basis. Rods are more easily available. Woven wire fencing and nail demand is strong, but barbed wire orders have fallen off. Order backlogs for fasteners—bolts, nuts, rivets and screws—have slackened and prompt deliveries can be made in most cases. Wire rope demand is holding up remarkably well.

Some specialty mills report that they are continuing on a two and three shift basis, five days a week, indicating that business is not at all bad in some quarters. Practically all mills are getting back some "rejected" wire, which in many instances is not due to bad wire, but is a question of price. The wire returned on a technicality is usually replaced by an order for similar material at current lower prices.

The Administration's Council of Economic Advisers, former New Dealers, are said to be planning a new drive for a controlled economy—as a check on further slipping and a spur to employment. Their bill is to be introduced in the Fall and will be called the Economic Expansion Act. If we are not to drift into socialism by degrees, where the American people will ultimately be no better off than the starved Russians—starved for everything that makes life worthwhile—this type of proposal should be nipped in the bud—decisively. America must be kept the land of the Free, or opportunity, initiative and progress will vanish into another Dark Age.

—from the Editor's Desk

Combat high costs with MORGAN-CONNOR WIRE MACHINES

PHOTO COURTESY
WICKWIRE SPENCER STEEL
PALMER PLANT

If your break-even point is soaring it's time to call in a Morgan engineer . . . Draw on his long experience in wire drawing . . . Let him recommend a replacement program to bring your costs in line . . . and to safeguard your markets. WM-37

MORGAN CONNOR

WIRE MACHINES

MORGAN CONSTRUCTION CO.
WORCESTER, MASSACHUSETTS, U. S. A.

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 24 JULY, 1949 No. 7

Designated as
Official Publication By The Wire Association

Contents

Editor's Desk, The 577

The Canadian Regional Meeting of the Wire Association 581

Wire Drawing of Some Non-Ferrous Metals by E. L. H. Bastian 588

Electrical Controls for Wire Mill Machinery by O. M. Bundy 594

Handling Wire and Wire Products with Industrial Trucks by G. B. Davis 599

The Los Angeles Regional Meeting of the Wire Association 604

Outstanding Personalities of the Wire Industry 607

A Review of Recent Wire Patents 610

Index to Advertisers 635

Where-to-Buy 636-640

WIRE and WIRE PRODUCTS is indexed regularly by Engineering Index, Inc., New York, N. Y.

— ASSOCIATE EDITORS —

Kenneth B. Lewis, Consulting Wire Mill Engineer

Lancaster, Allwine & Rommel, Consultants on Patent Information

Richard E. Brown, General Manager

R. S. Spengel, Business Manager

E. D. Sickels, Advertising Manager

Publication Office: Jersey City, N. J.

Executive Office: Stamford Trust Co. Bldg., 300 Main St., Stamford, Conn.

Annual Subscription, U. S. $5.00, Canada $5.00

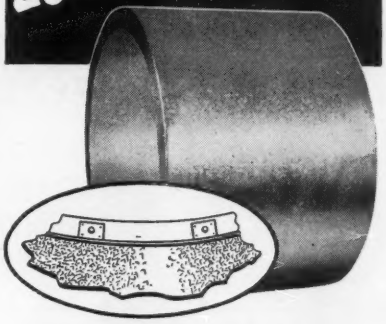
50 Cents a Copy in U. S. Issued Monthly Foreign $7.50

October Convention Issue $1.00 a Copy

January Convention Discussions Issue $1.00 a Copy

Copyright 1949, Quinn-Brown Publishing Corp. WIRE AND WIRE PRODUCTS is fully protected by copyright and nothing that appears in it may be reprinted wholly or in part without permission.

Extra strength
Extra service
and
20% less weight



NILES

"Reinforced Type"

FLANGED STEEL TRAVERSES

for wire and cable

. . . have extra strength where it is needed most—at bolt holes and base of the flange. This reinforcing makes possible the use of lighter gauge steel, saving up to 20% in weight while increasing overall strength.

Niles Flanged Steel Traverses have given as much as sixteen years' service without refinishing or major maintenance, according to actual experience records. In many cases their use has doubled the number of trips per reel before cut downs or scrapping of wooden heads.

They are manufactured in sizes up to 56" diameter and 48" traverse —in plain, painted or hot dip galvanized finishes—as light as 18-gauge steel. Width of flange and number of bolt and drain holes are furnished to your specifications. Available for prompt delivery. Write for prices.

• • •

Manufactured Under License Arrangements With Western Electric Co., Inc.

REPUBLIC STEEL

NILES STEEL PRODUCTS DIVISION

REPUBLIC STEEL CORPORATION

NILES • OHIO

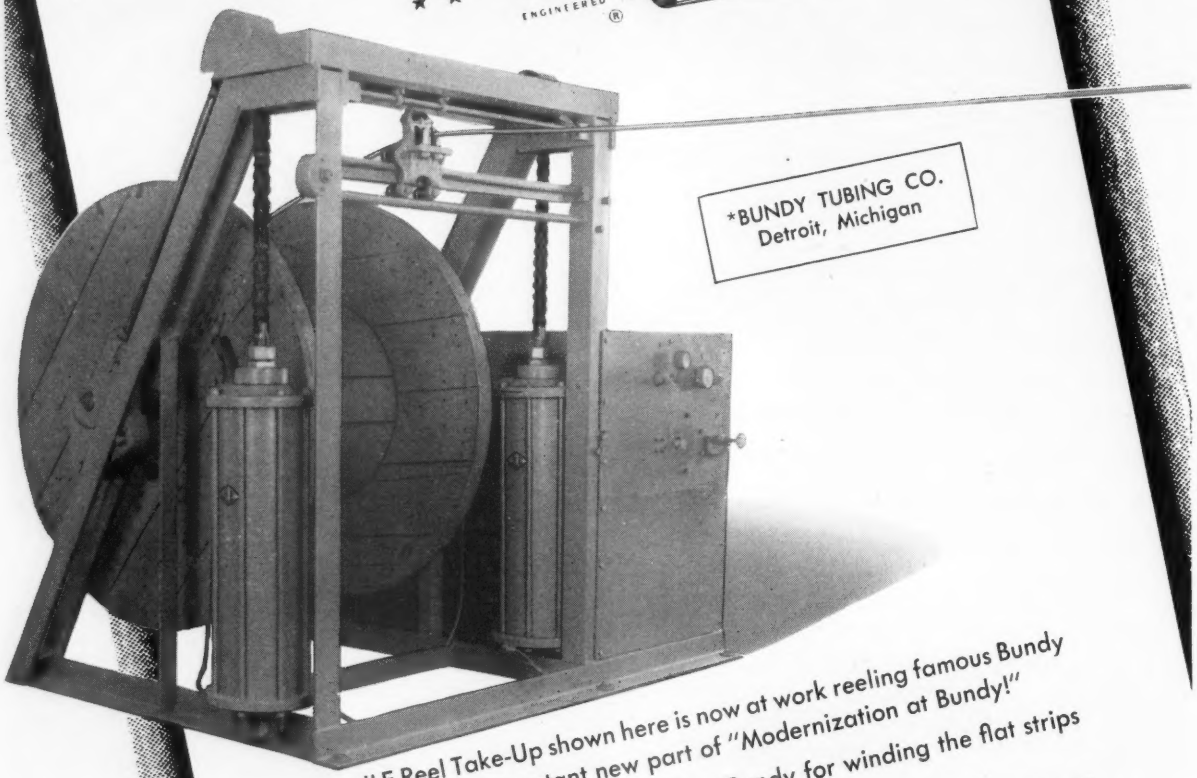
JLE

REEL TAKE-UPS

are part of Modernization at

BUNDY TUBING*

ENGINEERED TO YOUR EXPECTATIONS ®



*BUNDY TUBING CO.
Detroit, Michigan

The JLE Reel Take-Up shown here is now at work reeling famous Bundy Tubing . . . an important new part of "Modernization at Bundy!"

A similar JLE unit is also installed at Bundy for winding the flat strips from which the tubing is made.

Modernize your reel take-up operations . . . ask for the special JLE Reel Take-Up Catalog, Section 3-A.

JAMES L. ENTWISTLE CO.

43 CHURCH STREET, PAWTUCKET, RHODE ISLAND

30 YEARS OF SERVICE TO THE WIRE INDUSTRY

JLE

Canadian Representatives:
THE A. R. WILLIAMS MACH. CO., LTD.
64 FRONT ST. W.
TORONTO, ONT.

British Associates:
GENERAL ENGINEERING CO., LTD.,
BURY ROAD, RADCLIFFE,
LANCS., ENGLAND

JLE

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 24 JULY, 1949 No. 7

Wire Association Canadian Regional Meeting

First Canadian Regional Meeting of the Wire Association at Montreal, Quebec, Canada covering the two days of April 28th and 29th, 1949.

AT Montreal, Quebec, on April 28 and 29, the first Canadian Regional Meeting of the Wire Association was held with headquarters at the Mount Royal Hotel.

★ ★ ★

THURSDAY, the 28th, was devoted to plant inspection trips: one at the Steel Company of Canada's plant in the morning, and the other at the Northern Electric Company's new non-ferrous mill both at Lachine.

★ ★ ★

A GROUP of 180 attended these plant inspection trips for which transportation was furnished by one of the contributing companies, and the group attended a luncheon at the Northern Electric Company restaurant. Both of these inspections proved of keen interest to those attending. Processes and equipment appeared to be favorably comparable to those of the better mills in the United States. The Northern Electric plant, built since the close of World War II, was impressively new and efficient in layout and equipment.

★ ★ ★

THE second day was devoted to technical sessions. In the morning the following papers were presented:

"Wet Drawing Compounds" by Mr. E. L. H. Bastian, Staff Engineer of the Shell Oil Company, New York, N. Y. Mr. Bastian traced qualities required in wet lubricants with respect to machine speeds, die life, and physical properties and finish in drawing non-ferrous wires, covering the various classes of lubricants employed and the several types of wires on which they are commonly used. His paper was a scholarly presentation of a difficult and complicated technical subject.

★ ★ ★

"Dry Drawing" by Mr. Charles Orr, President, Standard Industrial Compounds Company, Chicago, Illinois. This paper was a non-technical treatise of the varying aspects of dry-drawing procedures and problems, treated from the standpoint of a mill-man's practical problems. In both the paper and the ensuing discussion, many points were made that provided "take-home" information of a useable nature. Out of Mr. Orr's many years of experience through first-hand contact with wire and die lubricating difficulties, an enlightening contribution was made.

★ ★ ★

AT the afternoon session the following papers were presented:

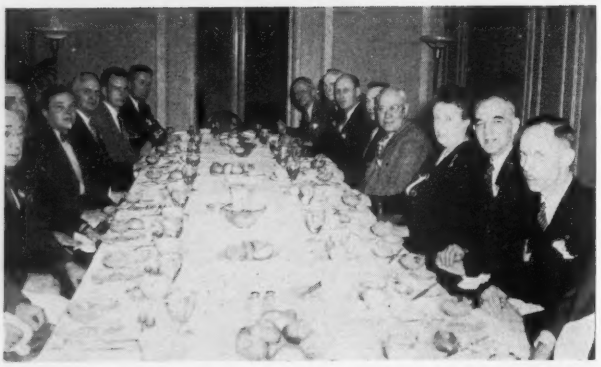
"Modern Electrical Control for Wire Mill Machinery" by Mr. O. M. Bundy, Assistant Chief Engineer, Clark Controller Company, Cleveland, Ohio. Wire mill controls, with the increase of speeds of operation, have greatly increased the need for better motor controls. This paper, highly technical, covered practically all types of motors and operating conditions, stressing the many factors that made for efficient mechanization of the motors that power modern equipment. Mr. Bundy is to be congratulated for his able and helpful paper.

★ ★ ★

"Modern Pyrometric Practice and Controls" by Mr. J. R. Green, Minneapolis—Honeywell Regulator Company, Pittsburgh, Pa. Mr. Green's paper covered a phase of wire and wire product fabrication that is specifically related to the maintenance of consistent quality through the use of pyrometric controls in furnaces, ovens and various places where heat is employed, stressing the indispensability of proper control of these factors.

★ ★ ★

"Material Handling" by G. B. Davis General Sales Manager, Baker-Raulang Company, Cleveland, Ohio. The talk and the picture presented by Mr. Davis covered a variety of specific materials handling problems in a number of plants. The importance of a system to handle ma-



Luncheon of Canadian Regional Meeting Committee Members. * *

Chuck Orr of Standard Industrial Compounds Co., Chicago, Ill., and John Coppick of the Canadian Steel Co. * * * *

terials efficiently was clearly demonstrated, involving both equipment and storage methods and was a constructive contribution to the program.

★ ★ ★

FOLLOWING the plant inspection trips on the 28th, there was a dinner at the Mount Royal Hotel preceded by a most successful and enjoyable "get together" cocktail party.

★ ★ ★

AT the dinner, **Allan Dove,** Chairman of the Meeting, expressed the gratification of the Canadian members at having so many representatives of the Association from the States, many of whom came long distances to attend. He was followed with a short address by **LeRoy D. Seymour,** President of the Wire Association, and then by the Mayor of The City of Montreal, the Honorable **Camillien Houde.** Mayor Houde welcomed the members of the Wire Association on the behalf of the Canadian government and created a great deal of amusement when he stated that despite all his "mistakes" of the past, he had not been guilty of a single error during the past couple of months since he was given increased powers by the Quebec Legislature.

★ ★ ★

MR. A. A. GARDINER, of the Canadian National Railways, delivered an informative and entertaining talk stressing the unique differences of the peoples of Canada's ten provinces which made up the national character. A unique feature of the dinner was the presentation made by **T. A. Gass,** of the Canada Wire and Cable Company, Toronto, of a combination radio and phonograph set to **J. A. Woodard** of the Federal Wire and Cable Company of Guelph, Ontario, as being the man with the longest service in the non-ferrous wire industry in Canada. Mr. Woodard has had fifty-nine years experience with firms in different parts of Canada.

★ ★ ★

MR. Gass in the making of the presentation said:

Mr. Chairman, Your Worship, Ladies and Gentlemen

ALTHOUGH Canada is a young country, industrially, I would like to point out for the information of our American friends, that we are not so young in the Non-Ferrous wire industry as evidenced by the fact that one of our Canadian companies, the Phillips Electrical Works Limited, is, this year, celebrating their Diamond Jubilee after 60 years of manufacturing Non-Ferrous Wires and Cables in Canada, and that there are at present 15 companies manufacturing this product in Canada to serve a population of approximately 12 million people. The steel wire industry was well established in Canada before the manufacture of Non-Ferrous Wire got under way.

R. A. Kerr of the Northern Electric Co., Ltd., and A. M. Bundy of the Clark Controller Co., Cleveland, Ohio. * * * * *

IT is a pleasure to be called upon to do honour to a very old friend, Mr. James Woodard, or "Jimmy" as he is so well known to all of us in the Non-Ferrous Wire Industry in Canada.

★ ★ ★

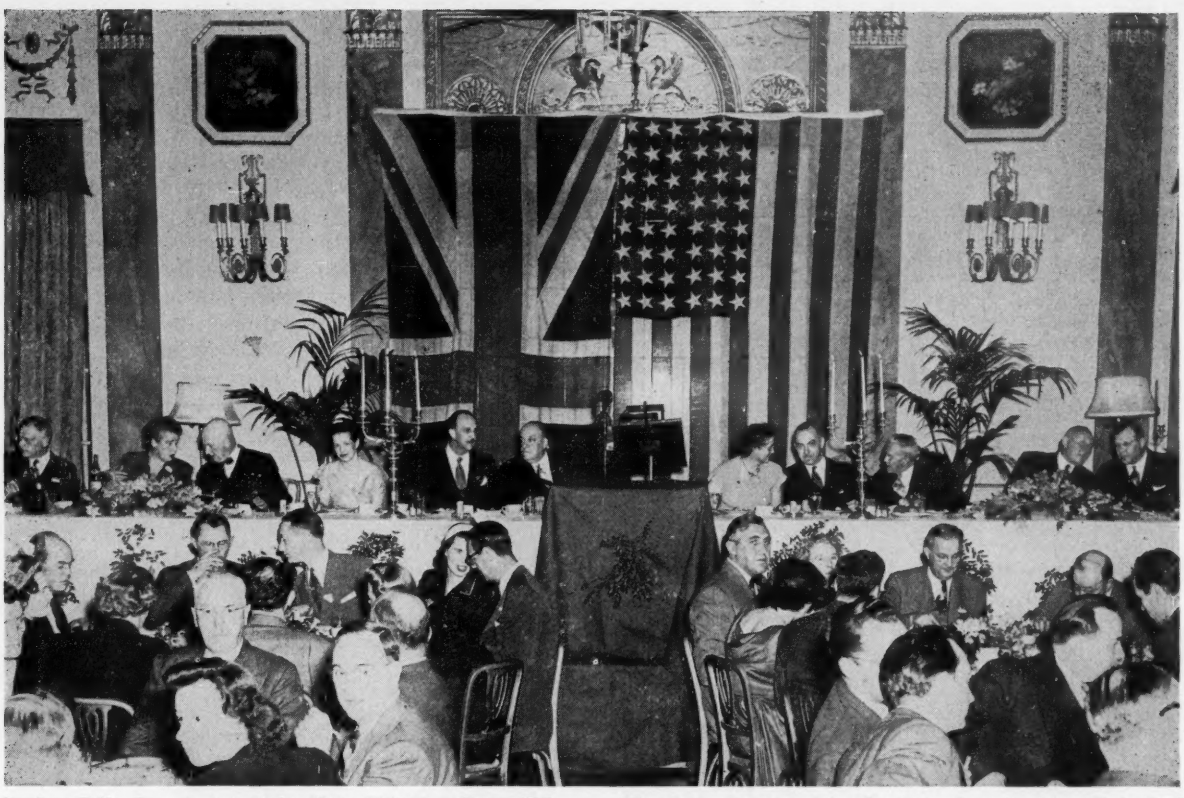
WHEN I say old friend, I mean not only personally, but an old business friend, as Jimmy is old in experience and wise in the ways of the wire business, and is, I believe, the oldest man with the longest term of active service in the Non-Ferrous Wire business in Canada.

★ ★ ★

I ASSUME that one reason I have been asked to do this job is that I believe with my own age and 38 years' service in the industry that I am probably the next oldest man in years and experience still active in the Canadian Non-Ferrous Wire Industry, although my nearly 40 years, which seems a long period, is relatively short when we think of Jimmy's nearly 60 years' service, but perhaps if there are any salesmen here they will agree with me that 40 years in the selling game from the viewpoint of wear and tear is about equal to Jimmy's 60 years in the comparatively quiet atmosphere of manufacturing, where, as all salesmen know, there are no worries. Perhaps this accounts for Jimmy's youthful appearance.

★ ★ ★

A LITTLE history of his experience in the wire industry might be timely and interesting. Jimmy started his career in the wire industry with the predecessor company of the Canadian General Electric Company, the old Edison Company in Sherbrooke, Quebec, in May 1890, and I believe received the handsome remuneration of 5c per hour, when this plant, which among other electrical products, manufactured Magnet Wire, was moved to Peterboro, Ontario, in 1891 where the main works of the C. G. E. are now located, Jimmy went with the machines but had his importance recognized by being paid 10c per hour to go there. I only mention these rates to show the difference in wage scales in the past 60 years. While at Peterboro, Jimmy was put in charge of the Magnet Wire Department, Coil Winding Department, etc., where he remained until 1898, when he resigned from C. G. E. and went



Speakers Table—From Left to Right—Major Richard E. Brown, Publisher, Wire & Wire Products, Stamford, Conn., Executive Secretary, The Wire Association; Mrs. R. S. Spengel, Sec.-Treas., Wire & Wire Products, Stamford, Conn., Assistant Secretary, The Wire Association; A. A. Gardiner, General Passenger Agent, Canadian Pacific R.R.; Mrs. Allan Dove, L. D. Seymour, Mgr. Wire Mills Division, John A. Roeblings Sons, Co., President, The Wire Association, Roebling, N. J.; Hon. Camillien Houde, Mayor of Montreal. Mrs. L. D. Seymour; Col. Allan Dove, Supt. Dominion Works Steel Co. of Canada, Chairman, Canadian Regional Meeting Committee; James Woodard, Federal Wire & Cable Co., Guelph, Canada; Thomas A. Goss, Sales Manager, Canada Wire & Cable Co., Montreal, Can.; and Fred M. Crapo, President, Indiana Steel & Wire Co., Muncie, Ind., Vice President, The Wire Association. * *

to the Royal Electric in Montreal, which in 1901 was absorbed by the C. G. E. but Jimmy remained there until that plant was in turn moved to Peterboro in 1904, when he resigned.

★ ★ ★

AT that time the Wire & Cable Company, predecessor to the present Northern Electric Company, was getting ready to manufacture Weatherproof Wire in addition to their then existing lines of Telephone Wire, etc., and Mr. J. D. Hathaway, a name long and favourably known in the Canadian wire and cable industry, promptly hired Jim to take charge of this new department, to which he gradually added the Rubber, Braiding and Finishing Departments, and later Magnet Wire Department finally Jimmy becoming General Foreman, which position he held until 1911.

★ ★ ★

AFTER leaving the Wire & Cable Company, Jimmy worked with the late Geo. H. Olney at Phillips Electrical Works Limited, Montreal, who were at that time just starting the manufacture of Rubber Covered Wire. He remained with them until Boston Insulated Wire Company started their Canadian plant in Hamilton, Ontario, when Jimmy was promptly engaged by them as General Superintendent and remained with them until October 1914, when he resigned to accept a position with Canada Wire & Cable Company, becoming Superintendent of our Dundas Street Plant, and later, General Superintendent of our new plant which opened in Leaside in December 1918, being promoted to Works Manager in 1923, and Works Manager of the combined Canada Wire and Standard Underground Cable Company's plants when that company was taken over by Canada Wire & Cable in 1929.

★ ★ ★

DURING his stay in Leaside, he started to take an interest in Municipal affairs, and was the first Chairman of the Leaside Public School Board in 1921, but soon found scope in a larger field, being elected to the Leaside Town Council in 1922 and appointed Chairman of the Combined Works & Police Department, which absorbed his surplus energy during the early days of the town's really phenomenal growth.

★ ★ ★

IN 1934 Jimmy was appointed Consultant to the operating staff at Canada Wire & Cable Company, but his natural energy seemed to require more active work, so he resigned from Canada Wire in March 1935, going to Federal Wire & Cable Company at Guelph, where I believe he has held all senior positions except the Presidency, but he is still there and a young man yet! !

★ ★ ★

IN recognition of his long service, in and to the industry, the Canadian Non-Ferrous Section of the Wire Association has asked me on their behalf to present to him this Combination Radio and Victrola Set, which I now have great pleasure in doing, with the sincere wish from all of us that he may be able to enjoy it for many years to come.

★ ★ ★

AT the conclusion of the dinner many of the members adjourned to the Normandie Roof of the Mount Royal Hotel for a continuation of the evening's entertainment.

★ ★ ★

FOR the information of those who were unable to be present at the meeting, a description of the plant inspection trips together with the technical papers presented at the meeting, will be found following in this issue of WIRE AND WIRE PRODUCTS.

★ ★ ★

THE committee in charge consisted of:

A. B. Dove—(Chairman) Supt. Dominion Works, The Steel Company of Canada, Limited, Lachine, Que., Canada.

H. B. Carnahan—Works Manager, Canada Wire and Cable Company, Limited, Leaside, Ontario, Canada.

A. Lauder—Works Manager, Phillips Electrical Works, Limited, Brockville, Ontario, Canada.

R. S. Hull—Managing Engr., Wire & Cable Dept., Canadian General Electric Company, Limited, Peterborough, Ontario, Canada.

Taylor Cornelius—Works Manager, Aluminum Company of Canada, Limited, Shawinigan Falls, Que., Canada.

J. W. Galloway—Plant Engineer, The B. Greening Wire Company, Limited, Hamilton, Ontario, Canada.

T. R. Jopling—Asst. Gen. Supt., Canadian Tube and Steel Products Limited, Montreal, Que., Canada.

C. W. Baker—Canada Wire and Cable Company, Limited, Montreal East, Que., Canada.

T. J. Tracey—Canadian General Electric Company, Limited, Montreal, Que., Canada

George Layt—The Steel Company of Canada, Limited Lachine, Que., Canada.

W. Walker—Phillips Electrical Works, Limited, Montreal, Que., Canada

D. Boyd—Metallurgist, Northern Electric Company, Limited, Montreal, Que., Canada.

H. Miller—(Secretary) Works Mgr., Wire & Cable Div., Northern Electric Company, Limited, Montreal, Que., Canada.

THE registered attendance was 250, while at the dinner there were 354 people. From every standpoint, this may be considered the most successful regional meeting ever held by the Wire Association. Entire credit should be given to the committee in charge, and by special action of the Board of Directors of the Wire Association, a vote of thanks on behalf of the Association has been extended to the committee and letters to this effect have been sent to Mr. Dove as Chairman and to Mr. Miller as Secretary.

* * *

Wire Association Visit to Dominion Works Steel Company of Canada at Lachine, Quebec, Canada, April 28th, 1949

REGISTRATION commenced at the Mount Royal Hotel by 9:30 a.m. on the above date. It was already evident by 10:00 that we should have to commence bus movements because the registration lobby was becoming so crowded that it would be difficult to get people moving on their way.

* * *

BUSES were loaded by shortly after 10:00 while it was expected that only three buses would be required for the trip, it was necessary before 10:30 a.m. to put the fourth bus into service. This with a number of cars, carried the party of 176 members of the Wire Association and members of Canadian and American Wire groups to Dominion Works for the first stage of the day's visit.

* * *

WHEN the buses arrived at Dominion Works the first bus groups were met and addressed by the Sub-Chairman of the visits committee, **G. Layt**, Assistant Superintendent, Dominion Works. The route had been arranged by a "guiding-arrow" system by which personnel entered the storeroom door at the extreme west of the mill and were handed goggles for use during the trip. The trip carried the personnel through the Pattern Shop, Blacksmith Shop, Machine Shop and finally to the Die Room at the end of the mechanical building. Here they were enabled to see a small Die Room in a 3,000 ton mill arranged with the minimum space and the maximum amount of convenience to the operators. Much interest was displayed in this section of the plant.

* * *

THE party went on to the Wire Mill where the second stage of transmutation from single blocks to continuous frames had already been completed. Up until the end of 1948 this particular department had only two continuous frames of the low carbon air-cooled variety; to these had now been added four of the latest Vaughn air-cooled, water-cooled machines covering the range from 20 ge. to 9 ge. in high carbon wire with block sizes of 16" to 22". The new generator room, which had a Ward-Leonard control system and which supplied power for these machines, was of interest to most of the visiting party. It was found quite difficult to get the party moving from the Cleaning House which they discovered on their way by from the Generator Room. It had not been intended that the Cleaning House be a part of the visit but a great many members of the party certainly took advantage of viewing this small straight line system. The Cleaning House consists of two 3 rod pin tubs, water wash, high pressure rinse, two lime tubs, and a Morrison flash baker. Due to route congestion in the older part

Welding Wire Extrusion at the Dominion Works of the Steel Company of Canada.

of the mill all handling in this system is done by trucks and tractors.

★ ★ ★

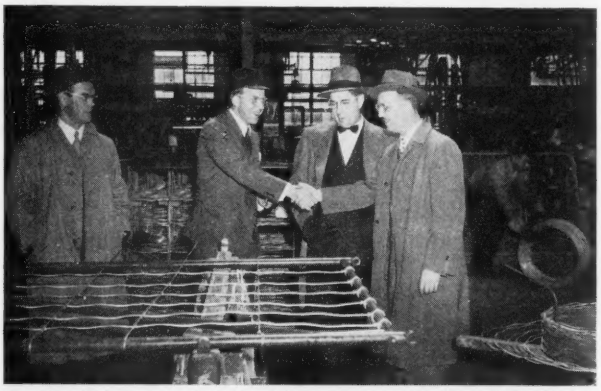
THE party now moved to the Storage Room where they saw the welded fabric machine in operation. This machine electrically welds fabric up to 60" width in sizes from 9 ge. and finer. During the visit the equipment was operating on concrete reinforcing stock.

THE party next entered the Electro-Galvanizing department where they were shown a half scale model of an electro-plating section. The Langbein Pfanhauser Werke process was installed at Dominion Works 14 years ago and is capable of providing coatings up to 2.4 oz. per sq. ft. One interesting feature was that the model which was on display had been built by the employees themselves in order to show exactly how they were doing their job.

★ ★ ★

THE party passed beside an Oil-Tempering frame which was oil-tempering flat wire for Sash Spring Balances. The equipment was apparently quite novel judging from the interest which was

(*Please turn to page* 615)



Gate Making, Fence Dept., Dominion Works of the Steel Company of Canada. * * * * * * * * * *

F. Shaw of the Galy'g. Dept. of the Dominion Works of the Steel Company of Canada, Ltd., giving Jerry Gwyn of the Aluminum Company of Canada, Ltd., the lowdown on Langbien Pfanhauser process electiogate.

Trip to Northern Electric Co., Ltd., plant at Lachine, Quebec; Canada, (with general notes on Northern Electric Co. Wire and Cable Division.)

BUSINESS connected with the electrical industry in its early days invariably started in a small way. The industry had yet to prove itself and it was only the farsighted who were able to visualize some of the possibilities of electricity as a tool of civilization.

★ ★ ★

NO exception to the rule was the business which through a steady process of development has grown into the Wire and Cable Division of the Northern Electric Company in Montreal, Quebec, Canada.

★ ★ ★

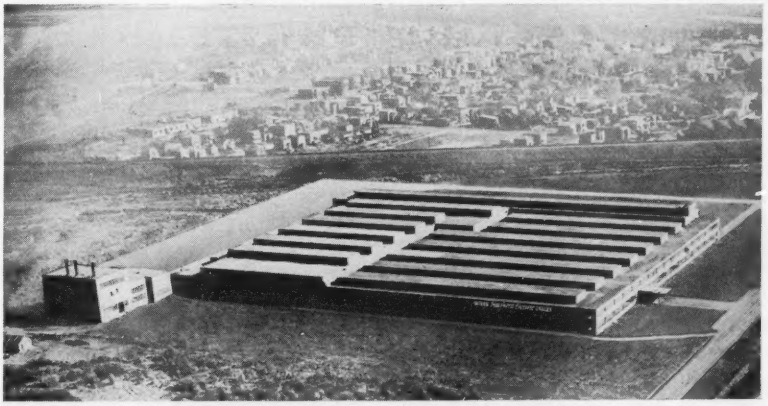
EARLY records reveal that in 1895 **Alexander Barrie**, a Scotsman established a business in Montreal to manufacture rubber insulated wire. The original factory was located on the second floor of a loft building at 178 Inspector Street, one of the narrow streets in the older section of the City of Montreal. There was a total of 530 square feet of floor space and Mr. Barrie was assisted by three (3) boys.

★ ★ ★

FROM this small beginning and through a series of constantly enlarging quarters has grown the present facilities of the Northern Electric Wire and Cable Division which occupies more than 550,000 square feet of floor space. The Division has more than 2,000 employees.

★ ★ ★

THE very latest of these expansions takes the form of a new



Aerial View of the Northern Electric Company, Ltd. Plant. * * * * *

modern single storey plant in the City of Lachine some six (6) miles west of Montreal.

★ ★ ★

175 Delegates to the First Canadian Regional Convention of the Wire Association visited this Plant on the first day of the Convention. Arriving by bus at 1:15 p.m. from the Lachine Mill of the Steel Company of Canada which they had visited in the morning, the visitors were served lunch in the Plant Cafeteria. A brief welcome was extended to the Directors of the Wire Association and to the assembled American and Canadian Wire and Equipment manufacturers by **H. Miller,** Works Manager of the Wire and Cable Division.

★ ★ ★

THE visitors were then shown the Plant in groups of 6-8 under the direction of experienced guides from the supervisory and engineering staff of the Division.

★ ★ ★

THIS modern non-ferrous mill which is shown in the accompanying airplane view was planned throughout by the use of three dimensional models (see cut). The mill incorporates the most modern facilities for rapid materials handling by use of cranes and fork trucks (see cut). The wide aisles (up to 12 feet wide) total more than one (1) mile in all.

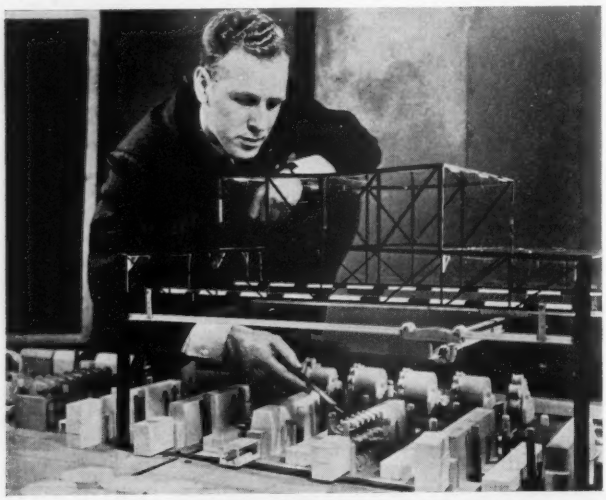
★ ★ ★

MANUFACTURING areas were laid out for straight line flow from the reception of Raw Material through a great variety of wire processes to final packing and dispatch with handling and transporting cut to a minimum.

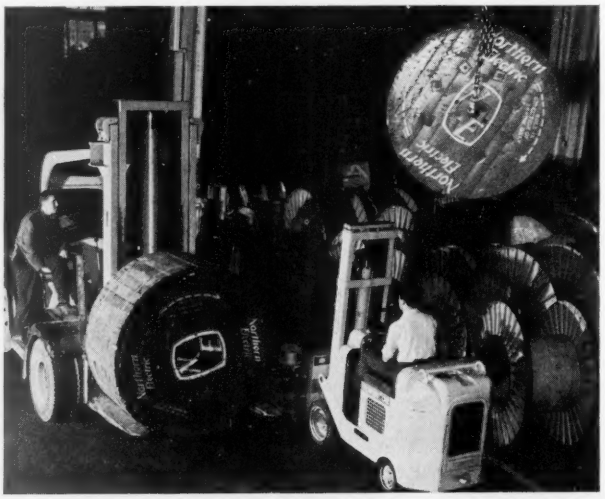
★ ★ ★

THIS Plant which has approximately 314,000 square feet of floor space and is 600 ft. long,

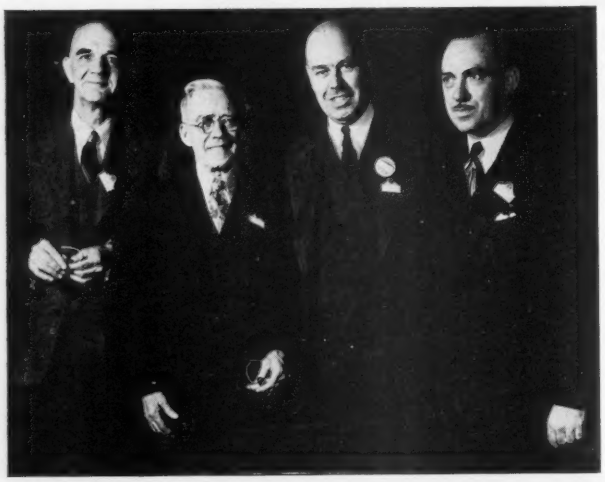
(*Please turn to page* 614)



Model Used in Planning the Northern Electric Co., Ltd. Plant Layout.



Handling Heavy Reel with Electric Trucks at Northern Electric Co., Ltd.

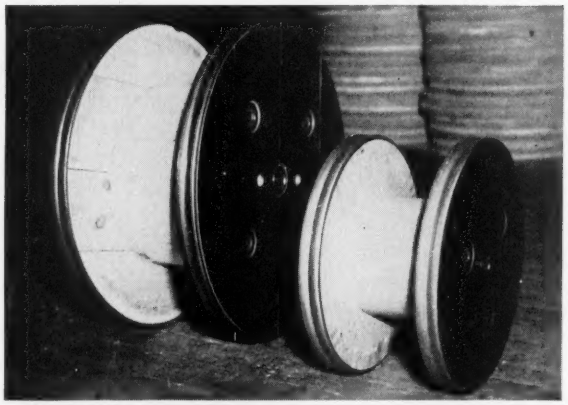


A. Lauder, Wks. Mgr., Phillips Electrical Co., J. A. Woodard, Federal Wire & Cable Co., H. Miller, Wire & Cable Div., Wks. Mgr., Northern Electric Co., and A. B. Dove, Wks. Supt., Steel Company of Canada.

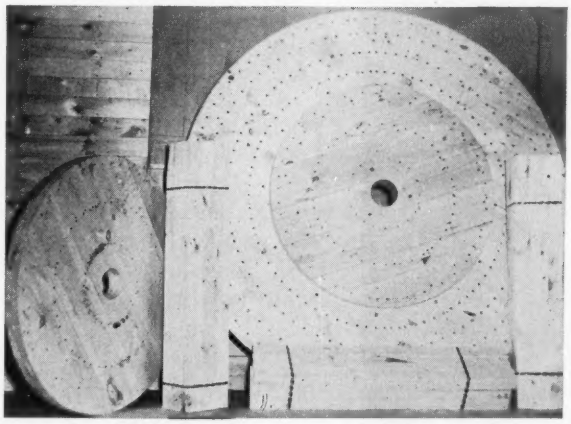
Inspecting a reel of toll telephone cable at Northern Electric Co. are Ralph Biggar, K. C., President of Canadian Drawn Steel Co., T. J. Bell, Gen. Mgr., Federal Wire & Cable Co., R. E. Brown, President Wire & Wire Products and Secretary of Wire Association; Roy L. Gladwell of Aluminum Co. of Canada and S. B. Thomas of Northern Electric Co., Wire and Cable Div. * * * * * * * *

Are Your
REEL COSTS HIGH?

Perhaps **NARCO** can help you. This modern reel plant, located in the heart of Maine's timberlands, offers lumber products direct from the forests to you.



NARCO Metal-Bound Reel



NARCO Knocked-Down Reels

METAL BOUND REELS

ASSEMBLED REELS

KNOCKED DOWN REELS

REEL FLANGES

LAGGING

PAINTING - STENCILING

BLOCKING

WHOLESALE LUMBER

KILN DRYING

Reels, Metal Bound, made in any diameter from 12" to 42", with or without tension groove. Prompt deliveries.

Address inquiries to:

NORTH ANSON REEL COMPANY

Established 1909

NO. ANSON, MAINE

Telephone: MADISON 187-2

Wire Drawing of Some Non-Ferrous Metals

By

E. L. H. BASTIAN

Lubricants Staff Engineer, Shell Oil Company, Inc.

New York, N. Y.

A paper presented before the Canadian Regional Meeting of the Wire Association, Montreal, Canada, April 28-29, 1949.

Introduction

WHILE the subject of this paper is wire drawing, it is intended here to discuss wire drawing lubricants or compounds principally as they relate to the broader subject in the non-ferrous metals field.

★ ★ ★

WHAT then can be said specifically on this matter which will be of interest to wire mill operators. Since the sole purpose of the use of drawing lubricants is to facilitate the drawing of the wire, it must do so by virtue of characteristics which have a favorable effect on the results desired.

★ ★ ★

THESE results are similar in any wire drawing operation, but obviously will carry different quantitative values dependent upon the metal being drawn. Whether considered technically, or solely by the criteria of operating experience in the mill, they usually come out to the same thing.

★ ★ ★

IT may be well then to state briefly what these things are before getting into the specifics of drawing methods, compound formulations, and procedures applicable to drawing non-ferrous wire.

★ ★ ★

THE results desired are predicated usually on three things:

1. Highest possible drawing speed compatible with the type of machines available and other results on dies and the wire. This is merely another way of saying, highest production output at an economical cost for equipment and operation.
2. Best possible die life, which again reflects the cost aspect. This is important in proportion to the ratio of die cost to the value of the wire produced.
3. The required physical properties and finish of the wire drawn. This factor will carry greater or less importance in the overall operation dependent upon the intended use of the drawn wire. In the ferrous field, for example, two extremes in such requirement might be stainless steel aircraft or recorder wire, on the one hand, and fence wire, or welding rod on the other.

★ ★ ★

IT will be quickly recognized that these results, as stated, impose a variety of requirements on the drawing lubricant which are not likely to be met by any single formulation.

★ ★ ★

E. L. H. Bastian is Lubricants, Staff Engineer for the Shell Oil Company, Inc., New York. After graduating from the Case Institute of Technology in 1931 with a B.S. degree in mechanical engineering he studied at Wayne University, University of Michigan, Columbia University and the John Huntington Polytechnic Institute. He began his career with Shell in 1936 and has become an authority on fluids and emulsions used in precision metalworking. He is a member of the American Society of Tool Engineers, the American Society for Metals, the Wire Association, and American Society of Mechanical Engineers.

THE drawing process as a whole may be likened to a well balanced, rather sensitive mechanism, wherein the factors of mechanical machine limitations, die material, work metal, and lubricant or coolant are matched up to keep a hypothetical scale indicator, if you will, always pointing toward the profit side of the bookkeeper's ledger.

★ ★ ★

OBVIOUSLY, the most useful contribution the compound or lubricant supplier can make in this respect is to supply, or be ready to supply, the particular product which fits into the drawing process most smoothly. Even more to be desired, the lubricant should, if possible, permit an adjustment of other conditions in a direction which will favor increased economy in the overall operation.

★ ★ ★

I THINK you will agree with me that such lubricants are rarely plucked from the thin air on the spur of the moment. More generally, and logically, they are developed, sometimes laboriously, to meet the requirements at hand.

★ ★ ★

Function of Wire Drawing Lubricants

SINCE these requirements apply in all classes of wire drawing, including the non-ferrous group, let us review a brief statement of them so as to have freshly in mind their significance to the latter part of this discussion. The drawing lubricant should:

1. Provide lubrication and reduce friction between the die and the wire.
2. Prevent any metal pickup or welding of work metal onto the dies. This function

may be served by the simple physical mechanisms of lubrication, or even cooling, but is, in most cases, where boundary lubrication prevails, more appreciably enhanced by the chemical mechanism characteristic of chemically-active constituents in the lubricant.

3. Cool the dies and work metal to a bulk temperature optimum for the operation. This is a principal function of solutions used in wet wire methods. In dry drawing, or where lubrication is provided by use of a grease box, water cooling of dies is commonly used to good advantage.
4. Maintain good service stability (particularly referring to wet wire solutions). Minimize rancidity, deterioration, odor development, noxious fumes, vapors, or secondary decomposition products which might affect quality of work or operator's safety.
5. Be relatively easy to apply and subsequently to remove from drawn wire, where such removal is indicated.

★ ★ ★

Methods of Drawing Non-Ferrous Wire

PREPARATORY to discussing types of wire drawing lubricants which meet the functional requirements described, it will no doubt be apropos here to speak of methods since they influence, in a sense, the type of lubricant selected.

★ ★ ★

THIS statement may be clarified by an example. For instance, a given operation in a mill producing fine copper wire employs a battery of modern multiple-die wet wire machines. By design, arrangement and purpose, the logical lubricant here is that one most commonly used, a wet "solution" or emulsion of lubricant in water.

★ ★ ★

THE design of circulating system for the emulsion lubricant, the size, spacing, and disposition of die arrangement in the machine are all based on the use of a circulating fluid which experience has shown to be best for the purpose, since it provides necessary cooling as well as die lubrication.

★ ★ ★

NOW if, for instance, the idea of use of some other type or form of lubricant (such as a solid or semi-fluid substance) should be proposed in the interest of improved lubrication and die life, it is obvious that the application of such a lubricant might present a rather formidable situation. It is in this sense that method affects the choice of lubricant.

★ ★ ★

ALTHOUGH some non-ferrous wire is drawn by dry lubricant or grease box methods (principally rod and heavy wire in single hole machines) most non-ferrous wire drawing utilizes the wet wire system in multi-die continuous machines, principally in order to effect adequate die-cooling.

★ ★ ★

Types of Lubricants

AS may be surmised from the above mention of methods of drawing, there are several types or classes of lubricant commonly used in commercial practice on non-ferrous wire. These are as follows:

1. **Dry Soap Powder** — usually soda soap of a very fine size which may be used alone in a box ahead of water cooled carbide dies on single hole or 3, 4, 5 and 6-hole machines. While this is common practice in drawing carbon steel wire (in such machines as Morgans, for instance) in the case of some non-ferrous wire, it is more likely that the dry soap is used in conjunction with a heavy oil or grease type of lubricant. This will be covered in more specific detail when discussing particular kinds of metals being drawn.

★ ★ ★

2. **Heavy Oils or Greases**—these may be mineral oil, fatty oils or fats, or combinations of these with soap in order to secure the requisite grease-like consistency so as to be retained in the lubricant box. Again, such lubricants are applicable only in machines designed to accommodate the physical characteristics of the material. Such products may also contain solid pigment fillers such as calcium carbonate, talc, lamp black, etc. For some classes of non-ferrous metals, solid lubricants alone may be employed, or they may be suspended in a vehicle to facilitate application ahead of the die.

★ ★ ★

FOR some non-ferrous metals other than copper or the copper-alloys, the solid or semi-fluid lubricant may contain chemically active constituents, principally sulfur, chlorine, and phosphorous compounds. While effective from the standpoint of lubrication at high pressures, the detrimental staining character of such compounds on copper and its alloys is well known.

★ ★ ★

3. **Aqueous Solutions or Emulsions**—commonly prepared by mixing either fluid or paste-type lubricants with a high proportion of water, and applying the resultant solution or emulsion by circulation in the machines.

★ ★ ★

THE conventional and well-known paste-type drawing compound supplied for wet-wire systems is the most common variety of lubricant used in the non-ferrous wire industry. There are literally scores, if not actually hundreds, of such compounds offered in the market. While many of these are relatively similar to one another, there are considerable differences in some formulations. Many of these differences are based on sound investigation to meet particular needs. These needs may vary from mill to mill, dependent upon speed of drawing, finish requirements, solution temperatures, and a number of other factors.

★ ★ ★

IN practically every fine copper wire plant, however, foaming of the solution is a difficulty to be guarded against. With some wet wire solutions, if the concentration is reduced enough to preclude foaming, faulty lubrication at the dies

may result in poor slip, excessive die failure and rough wire.

★ ★ ★

AT least one recently developed compound, which practically eliminates foaming, is not a compound at all but a water miscible type oil which incorporates oils, soaps, and water coupling agents in a clear, light, homogeneous fluid easily mixed in water without need for drastic agitation as is the case with the paste-type compounds. This oil type product has proven satisfactory in both copper and steel wire drawing operations.

★ ★ ★

ANOTHER type of lubricant used in making up wet wire drawing solutions is, of course, our old friend the soap chip. Soap solutions have been found very efficient for some classes of fine wire drawing. However, one big drawback is the disposition toward excessive foaming unless the soap concentration is kept very low. Where additional lubrication then necessitates adding other lubricating constituents, such as fatty oils, etc., we are back to the soap-fat paste type compounds more generally used. The composition and suggested mixtures of such materials will be discussed specifically under the various types of metals being drawn.

★ ★ ★

IT will be noted that this entire third group of lubricants has been referred to as aqueous solutions or emulsions. The terms are not synonomous although they are often so used in the industry. Most so-called "solutions" used in wet wire systems are actually emulsions or suspensions of oil in water, which may be derived originally either from fluid or paste type lubricants. There are some commercial water soluble products, however, which do form true solutions and are hence properly so designated.

★ ★ ★

4. **Drawing Oils**—while some of these are heavy bodied for use in a lubricant box ahead of the die, the type of lubricant intended here is a relatively low viscosity fluid, usually a compounded mineral oil, which lends itself to circulatory application. In this respect, such lubricants, like aqueous fluids, may be used in wet wire drawing systems, thus facilitating the cooling function desired. If the volume of oil used, or the speed of circulation does not provide for maintaining a suitably low bulk oil temperature, some means of additional cooling is indicated. This may take the form of a water tube cooler or heat exchanger in the sump tank of the system, or, as in the case of some large industrial quenching oil systems, mechanical refrigeration may be used. In such installations the refrigerant is carried in coils immersed in the oil supply tank.

★ ★ ★

SEVERAL types of additives and compounds have been found useful in conjunction with light mineral oils for drawing non-ferrous metals such as copper and aluminum. Sulphonates, fatty acids, glycerides, and a number of fatty oils have been successfully used.

★ ★ ★

MORE chemically active additions may cause darkening and staining of the finished wire surface if carried in any appreciable concentration in non-ferrous drawing fluids. They are, however, useful in ferrous drawing practice.

★ ★ ★

IN fact, increasing acknowledgment is being made by investigators of the importance of chemical action at the oil-metal interface to account for lubrication effects. It appears that the chemical action involved may be quite complex and in reality composed of a large number of different reactions rather than a single chemical mechanism.

★ ★ ★

UNDER the condition of very high pressure characterized by practically all metal drawing processes, it is only reasonable to believe that lubrication may exist only as boundary lubrication wherein the usual relations among viscosity, speed, pressure and friction coefficients which pertain for hydrodynamic lubrication no longer apply.

★ ★ ★

IN the past, the use of so-called polar additives (such as straight chain fatty acids) has been considered to impart "film strength" or "oiliness" to the lubricant under such high pressure conditions, and to do so by virtue of the polar compounds ability to form a physically adsorbed oriented layer at the metal surface.

★ ★ ★

WHILE the use of such polar compounds has in many cases proven effective for boundary lubrication conditions, it is not at all certain, and becoming increasingly unlikely that many of the older concepts regarding the mechanism involved are valid.

★ ★ ★

IN other words, it appears that chemical reactions at the metal surface may be of considerably more pertinence to the type and range of lubrication provided than is the case for mere physical adsorption of a polar compound.

★ ★ ★

IN such cases, the effects of temperature and pressure on the additive or compounding chemical, and its degree of reactivity with the particular metal involved are obviously important.

★ ★ ★

A SIMPLE case in point is the reaction of a fatty acid, contained in a lubricant, with a metal surface to form a metallic soap.

★ ★ ★

BOWDEN (4)* states that "fatty acids are most effective as boundary lubricants only when they can react with the surfaces to form metallic soaps and leads to the conclusion that lubrication is effected not by the adsorbed layer of fatty acid itself but by the metallic soap formed on the metal surface."

*(4) Refers to reference at end of paper.

IT should be quickly pointed out here, however, that other investigators (5, 6)* have demonstrated that friction and wear are not necessarily, and in fact not usually, influenced quantitatively in the same direction at the same time by any given additive.

★ ★ ★

WHILE fatty acids are ordinarily good antifriction additives, dependent upon their reactivity with the metal surface, they are not usually good anti-wear agents.

★ ★ ★

Wire Drawing by Types of Metals Drawn

SINCE much of what has thus far been said is of necessity general in nature, it may clarify this discussion somewhat to speak of wire drawing by types of metals being drawn. The two most important of these are, of course, (1) copper, and its alloys, and (2) aluminum. The latter, while a relative newcomer in the wire industry, has taken an increasingly large amount of industry interest. Other nonferrous metals drawn into wire form are zinc, lead, nickel, tungsten, etc.

★ ★ ★

Copper and Brass Wire Drawing

ALTHOUGH copper and brass wire in heavy sizes may be, and sometimes is, drawn dry by the use of finely powdered soap, the wet wire method of drawing is much more commonly used in this field.

★ ★ ★

ON rod breakdown operation, the heavy starting size rod is passed through a lubricant box ahead of the first die, which contains either tallow or a neat compound containing a high percentage of a similar fatty material.

★ ★ ★

THIS box is usually heated by gas flame burners to keep the lubricant fluid and thus to facilitate a good coating on the rod entering the die. If cold, the tallow would "channel" in the box.

★ ★ ★

THE usual compound used in the emulsion for successive reduction of rod and intermediate copper wire (i.e., down to about B. & S. gauge No. 26-No. 28) is a combination of potassium soap, free fat (usually tallow or some hydrogenated fat containing a relatively low free fatty acid) and water. The free fatty acid is ordinarily held as low as possible in copper drawing compounds in order to prevent excessive formation of copper soaps. These soaps declare their presence by the appearance of green scum in the solution. While in some slight concentration these soaps may act as a lubricant, in the quantities formed in a solution containing high fatty acid, they are ordinarily considered abrasive to dies and, therefore, detrimental.

★ ★ ★

A TYPICAL range of properties in a compound of the type being described is as follows:

Soap, %	6-18
Saponifiable, %	40-65
Unsaponifiable, %	2-10
Free Fatty Acid, %	0.5-2.50
Water, %	25-40
Pigment Filler	None
Sulfur	Nil
Chlorine	Nil
Phosphorus	Nil

★ ★ ★

SUCH compounds do not usually contain either pigment fillers or chemically active constituents. The lower the soap content, within the range described above, the less likelihood for excessive foaming of the emulsion in circulating service when drawing heavy or intermediate wire at high speeds (2,500-5,000 feet per minute). The other factor which controls this is the concentration of soap-fat in the mixture circulated. Usual practice is to hold this at about 4 to 6% and maintain the bulk fluid temperature at 140-160°F.

★ ★ ★

FOR slower speed reduction of heavy wire, a compound containing somewhat more soap and less fat (still within the typical range previously listed) is used. In such compounds it is possible to hold free fatty acid to about 0.5% maximum by two means, (1) the use of normally low fatty acid oils, and (2) the use of inhibitors to maintain the low acid value.

★ ★ ★

HOWEVER, for some formulations it may be required to run the free fatty acid up to 1.5 or 2.0% in order to hold suitable stability in the emulsion or "solution."

★ ★ ★

THE discrete use of sodium hydroxide (a few pounds per month) in large wet wire solution systems is an offsetting control of acidity in the solution. A pH value held at about 8.5-9.5 is considered normal with the usual solutions.

★ ★ ★

FOR intermediate size (B. & S. No. 14 to No. 28) copper and brass wire, a soap-fat concentration of about 2 to 3% in the emulsion is usually used. Bulk temperature is held at about 110-130°F. and generally the same type of drawing compound is used as for rod breakdown.

★ ★ ★

INTERMEDIATE drawing speeds range up to 4,000-5,000 feet per minute in new design machines. In high speed drawing of these sizes, foaming may become a rather troublesome affair, unless suitable compounds are employed. One of these is a relatively low soap—high fat paste type compound. A combination of low and high titre fats is used to good advantage, and fatty acid runs about 1.0-1.5% (as oleic.).

★ ★ ★

ANOTHER type of compound, suitable for copper and brass drawing, which resists foaming extremely well in high speed systems is an oil type water miscible product described earlier under the subject of types of lubricant.

★ ★ ★

THIS lubricant is also suitable in the emulsion form for drawing fine copper and brass wire (B. & S. gauges No. 30-No. 46) at high

*(5, 6) Refer to references at end of paper.

speeds (2,400-5,000 feet per minute).

★ ★ ★

FOR intermediate wire sizes it is used in from 3-5% concentrations in the solution. For fine wire sizes, a concentration as determined by Babcock flask of 1.0-2.0% is adequate.

★ ★ ★

LIKE most special products designed for particular requirements, it has some idiosyncrasies. For the reason that the coupling agent contained in the neat oil is both oil and water miscible, when an emulsion is "broken" by the usual acid-addition test methods, the reading as secured by Babcock measurements will be low since some of the coupling agent will still be contained in the water phase. To correct for this in control testing, the Babcock reading is multiplied by a factor of 1.15. It is also desirable in making the Babcock test to use a very hot water bath to secure good separation of the "broken" emulsion.

★ ★ ★

THE neat oil or an emulsion made from it has an exceedingly active purging action in a system, and will tend to clean up such a system of old soap and fat deposits and other contaminants. The new solution may thus "load up" very rapidly and require an early change. A flush run of this type is ordinarily recommended to avoid later difficulties in build up of insoluble soaps and other contaminants on the machine sheaves and in the dies. When proper precautions are taken in introducing the solution as outlined, it has proven extremely satisfactory with respect to stability, non-foaming, fine wire finish, and good-die life. The material is also proving excellent for steel wire drawing in fine sizes.

★ ★ ★

IN a few cases of fine copper wire drawing this solution has indicated some tendency toward being sticky and lacking in "wetting out" characteristics. It was found that the addition of about 1-pound of soda ash (sodium carbonate) per 50 gallons of solution completely eliminated this condition. Another approach is the addition of a suitable wetting-out agent to the neat oil. This is being investigated now.

★ ★ ★

FREE fatty acid in the neat oil runs about 1.0%, typical. pH value of a 2% concentration solution in ordinary, soft tap water is about 8.0-8.5. Due to the acid value in the neat material a solution takes on a pale greenish cast almost immediately upon introduction in a fine copper wire system. This color, however, does not darken in service, nor does it appear to have any detrimental effect on drawing.

★ ★ ★

THE more conventional type of soft potassium soap compounds are still used predominantly in fine copper wire drawing. However, the problem with these is, of course, foaming. By some use of anti-foaming agents and a careful control on soap-fat concentration, foaming can usually be avoided in high speed wet-wire systems. The bulk temperature of the solution or emulsion is usually maintained at about 100-120°F. to avoid gelling of the soap. Concentration is usually held at 0.5-1.5% soap-fat solids. A typical commercial compound of the type described contains about 50% soft soap, 5-10% free fat, and the balance water, soap inhibitors, and other additives.

★ ★ ★

QUITE frequently a mixture of one part such compound with two or three parts of rod draw compound is used to good advantage on fine wire. This sort of combination minimizes foaming tendency but must usually be held at a reasonably high bulk solution temperature (120-130°F.) to avoid "wrapping" and sticky wire.

★ ★ ★

THE free fatty acid of the high soap fine wire compounds is ordinarily quite low (0.5% maximum) and presents no problem.

★ ★ ★

THE use of low concentration pure soap solutions and of fermented bran liquor solutions for drawing copper and brass wire are such old practices as to require no more than passing mention here. They may have some small economic advantage in use but also some operating disadvantages. The soap solutions often foam, and the liquor solutions smell very badly.

★ ★ ★

THE increasing use of more modern drawing compounds would appear to testify strongly to their superiority.

★ ★ ★

PRACTICALLY all copper, brass and other copper alloy wire such as phosphor bronze, cupronickel, etc., can be drawn successfully and economically with one of the newer type compounds available today.

★ ★ ★

Aluminum Wire Drawing

PROBLEMS attendant upon drawing of aluminum and some of its alloys have taken industry interest in about the same proportion as the rapid rise in volume of this material being drawn.

★ ★ ★

MOST aluminum wire drawing is being done in the same machines heretofore used for copper and brass, and in the case of rod and heavy wire this is drawn in single hole or 4, 5, and 6-hole machines heretofore commonly used for carbon steel rod and wire. In general, drawing speeds for aluminum are somewhere between those for steel and copper wire. Varying with the method of draw and the size wire being reduced, a number of different type lubricants are satisfactory.

★ ★ ★

FOR rod breakdown and heavy wire drawing (3/8" diameter starting size) the operation is ordinarily performed in standard type dry machines using water cooled carbide dies and either a grease, powdered soap, heavy compounded oil, or a combination of these. It is also reported that mixtures of lard

(*Please turn to page 626*)

WHEW!

We Certainly Started Something in the STAINLESS STEEL Field!

WE KNEW you would be interested in our new method of drawing stainless steel wire without lead, but your enthusiastic reception of this new process has almost bowled us over.

Those mills which have already installed this new process are counting up their blessings . . . and their increased profits, too.

Think of it . . . in "Sixty Secret Seconds" after the rod is cleaned of scale, it is prepared for the coating, and *nine minutes later* it is ready for drawing. Just imagine, if you can, the saving in time alone, which reflects itself in output and cost of finished wire. Beautifully finished, too, we might add.

When intermediate annealing is required, there is *nothing* to remove from the metal. Here is another time-consuming operation eliminated. And after annealing, all you need to do is repeat the same ten-minute operation and continue drawing.

The right lubricant is of *utmost* importance on stainless steel. Our Magnus Dri-Draw #4 was "tailored" to fit Metalcoat #267, and for wet drawing, there is nothing to equal our Magnus Wet-Draw #42 for smooth, lustrous finish.

We'll be glad to tell you what goes on during those "Sixty Secret Seconds." Just write us.

Magnus METALCOAT No. 267

Metal Coating Division

MAGNUS CHEMICAL CO., INC.

188 South Avenue Garwood, N. J.

Electrical Controls for Wire Mill Machinery

By

O. M. BUNDY

Assistant Chief Engineer, The Clark Controller Company

Cleveland, O.

A paper presented before the Canadian Regional Meeting of the Wire Association at Montreal, Canada, April, 1949.

ON the modern wire drawing machine, an electric motor supplies the power to draw the wire. But this power, in common with all other forms of power generation invented by man, will not follow his mental processes but insists on having peculiarities of its own.

★ ★ ★

ANY electric motor either of the alternating or direct current type inherently has rather rigid operating characteristics. The result is that when electric power is used on machines requiring specific and exact performance, it is necessary to use external contactors, relays and resistance to so modify the motor characteristics to accomplish the desired result.

★ ★ ★

IN the 19th century, when the arts of wire drawing, steel rolling, weaving, and many allied industrial arts were in their infancy, most of the processes were very slow. Power supplied either by water or steam was all that was available. Since speeds were slow, the starting and stopping which was experienced by throwing a belt or operating a clutch introduced few problems.

★ ★ ★

AS electric power was gradually brought into the industrial picture, the motor, at first, simply became the prime mover of the line shaft. As the shafting wore out, it was found to be easier and cheaper, to replace a large motor with individual motor drives for each machine.

★ ★ ★

FROM the turn of the century to the middle 20's, the wire drawing art gradually progressed, but not with spectacular strides. Machines were improved and speeds were raised. The operating requirements were only beginning to reach the point where some control of power was necessary beyond turning it on or off.

★ ★ ★

THE introduction of the Tungsten carbide die in the late twenties gave to the wire drawing industry a tool to solve one of its greatest difficulties. Now a die was available which would give a comparatively long life and would let the larger wires and rods be handled at greatly increased speeds.

★ ★ ★

SINCE that time, the machines, the dies, the drawing compounds and everything connected with the art have been progressing rapidly toward higher speed and better products.

★ ★ ★

PREVIOUSLY a single speed motor, with a manual controller was entirely satisfactory for many drawing operations. Now some fields of the art have increased speeds and require increased operating characteristics to the extent that it has been necessary to use quite elaborate controller and power equipment to give all the functions needed.

★ ★ ★

THIS change has required the operating men to give more and more attention to the control apparatus to make certain that their operating requirements are being met. The author can give assurance that the controller manufacturers have spent many days and nights finding solutions for many of the requirements of the wire industry as it has progressed.

★ ★ ★

IN a discussion of electrical control for wire mill machines, the author could show some complex diagram used for a particular machine which is familiar to many, and could describe its operation contactor by contactor and relay by relay. Such a discussion would be both tedious and pedantic.

★ ★ ★

INSTEAD the author has chosen to consider electrical control as it has grown in response to the needs of the wire drawing industry, what it can do in the way of giving better service at the present time and what will be required in the near future to give better controlled electric power.

★ ★ ★

TWENTY-FIVE years ago, if a machine was driven by a motor, all that was necessary to control it was to buy a safety switch or perhaps a magnetic contactor and some fuses. This was all the control that was required. If a direct current motor was used, a simple starter was sufficient. At that time the cost of the control equipment was small compared to the cost of the motors and it was seldom given a great deal of consideration.

★ ★ ★

THE picture has gradually been changing with respect to certain drives and certain processes. Today we find that in many processes in many industries control requirements have driven the cost of the control equipment to a greater value than that of the motors. This has been caused primarily by the fact that present day production requires performance under many different conditions and requires power characteristics greatly diversified from those inherently found in motors. The controller has been called on to supply those characteristics which the motor inherently lacks.

★ ★ ★

THE author does not wish for a single moment to give a distorted picture such as would cause one to think that any of the special characteristics mentioned have been the result of the fancies of some designer or have been added as frills.

★ ★ ★

IF a machine or a process is changed in the field, then the need for a special requirement will come from the operating man. If a new machine or a new process is being designed then the need will be foreseen by the designer. First, always, must be the need for such a particular or unique characteristic before the control manufacturer has the problem to solve.

★ ★ ★

AFTER some new function has been added to some process, the continued need and the usefulness of it will determine whether or not it will continue to be employed.

★ ★ ★

IN the wire drawing industry specifically the need for particular and exact characteristics has been more pronounced in the ferrous field than in the non-ferrous. As speeds and production are pushed higher in all fields of wire drawing the need for more exacting and carefully designed control equipment will become increasingly greater.

★ ★ ★

THE proceeding discussion does not infer that many machines of the future will not be driven by simple alternating current motors, because they will continue to be for many years. We are thinking instead, of the machines which have and will be designed to do much more in the way of drawing at higher speeds and producing better quality.

★ ★ ★

LET us then, consider what characteristics we have available which are inherent in the different types of motors with which we have to work, keeping in mind wire drawing requirements.

★ ★ ★

IT should be remembered that in some cases, special motors can be built to do special jobs. This may or may not be economical depending upon the number required and the desired operation. A special motor requires a spare to be carried to protect production, and if a standard motor can have its characteristics modified by the control equipment, then this alternate method may be preferable.

★ ★ ★

ALONG with these characteristics we will mention what can and cannot be done to the motors to obtain the most commonly required performance.

★ ★ ★

THE work horse of our entire industrial world is, of course, the alternating current squirrel cage motor. This motor with a simple controller will start, stop, and carry its load at a specific speed. This motor offers these inherent characteristics; an operating speed with only a slight droop with load, a pull out torque of roughly double full load torque, and a starting torque fifty per cent greater than full load. It performs these functions and performs them extremely well.

★ ★ ★

WHEN an attempt to modify these to fit any exact or regular pattern is made, then difficulties are encountered. To understand some of these difficulties, particularly with respect to frequent starts and stops, this basic fact must be considered; the squirrel cage motor on every start, absorbs in its rotor an amount of heat equal to the rotating energy of the system at full speed, plus additional heat losses incurred because of load and friction during acceleration.

★ ★ ★

IF a motor is thrown across the line in reverse, or plugged to a stop, then the rotor of the motor will absorb an amount of heat equal to approximately three times the energy in the system.

★ ★ ★

THE following facts must be considered in any attempt to modify the motor's characteristics. To vary the speed for continuous running, it is necessary to not only change the voltage but also the frequency. Frequency conversion apparatus is extremely expensive and except in very special cases where a large group of motors on some continuous process is involved, the system is seldom used.

★ ★ ★

ONE approach to modifying speed in the squirrel cage motor is the use of windings for more than one speed. These have been used with success on certain jobs, however, unless a number of duplicate units are used, the quantity of spares is an economic factor.

★ ★ ★

ONE of its biggest disadvantages lies in the inherent compromise in the design. The motor has to be a compromise between efficient operating conditions on various speeds. Its starting speed torque curves on the higher speeds are particularly irregular. This type of motor does not lend itself well to plugging. A controller for a two speed motor is practically the same as that for a single speed reversing one.

★ ★ ★

SOME multi-speed motors have been used with controllers

which will advance them speed by speed until the desired one is reached. These controllers become rather elaborate, and full consideration of this type of motor with its associated controllers has found very little favor in the wire drawing field. Usually the use of one or two gear changes and other types of motor have proven to give better operating characteristics.

★ ★ ★

IF an attempt is made to obtain slow and even acceleration on some particular machine, a speed torque curve is encountered which starts at, let us say, 175 per cent torque, drops back to 150, and then goes out to 200 per cent before reaching top speed.

★ ★ ★

DIFFERENT controllers such as primary resistance, auto transformer and reactor types have been employed for reducing the shock and increasing the starting time. Their main use has been to reduce the inrush current of the motor and to provide some cushion. In each case the rate of acceleration will vary with the speed torque curve so that uniform acceleration is difficult to obtain. Of course the heating of the rotor is still present under any of these conditions.

★ ★ ★

IF quick stopping is required, the most commonly used methods are a mechanical brake and plugging. Both involve the use of external rotating equipment. An electro-mechanical brake of the band or shoe type requires attaching the wheel to the motor. Where plugging is employed, a zero speed switch must be mounted on the motor shaft.

★ ★ ★

THE plugging method has the advantage that it can be modified to some extent by the use of a resistor in series with the motor, however, the excess heating of the rotor mentioned previously still is present. The rate of deceleration will seldom be uniform because of the shape of the speed torque curve.

★ ★ ★

THE mechanical brake does not give as wide a latitude as far as rate of stopping, but has the advantage that no heat is put into the rotor of the motor.

★ ★ ★

OTHER methods can be used for stopping the motor. Condenser braking gives some braking at high speed, but the effect falls off rapidly with speed and the method is seldom used.

★ ★ ★

DIRECT current braking does a very good job but requires a source of direct current power. It has been quite widely used where power has been available. The controller required is slightly larger than a plugging controller. The main reason for its preference over plugging has been the elimination of accidental motor reversing if the zero speed switch fails. With either of these methods the energy of the system less losses is absorbed in the rotor.

★ ★ ★

TWO of the objections to the squirrel cage motor were lack of control of the speed torque curve and the heating in the rotor. The wound rotor motor removes a part of these objections. It has the same running characteristics as the squirrel cage motor. The rotor is phase wound with as little resistance as possible enabling practically all of the secondary resistance to be controlled externally by the controller.

★ ★ ★

A PROPERLY designed controller can vary the speed torque curve in a manner to give a smooth and uniform rate of acceleration without excessive heating. The majority of the heat which formerly went into the motor now is dissipated in a separate resistor. As far as stopping is concerned, here again the controller can regulate the plugging speed to give a uniformly controlled stop. The energy dissipated formerly in the motor is now dissipated in the resistor.

★ ★ ★

IT can readily be seen that if a large number of starts and stops are required, a properly designed controller will allow a wound rotor motor to do jobs which are impossible with a squirrel cage type.

★ ★ ★

THIS type of motor also allows plugging to be used safely without a zero speed switch since a voltage relay can be used on the secondary resistor to stop the motor at standstill. The speed torque curve can be adjusted somewhat for a running condition, yet all curves run to the synchronous speed point at no load, and satisfactory speed control can be obtained over only an extremely small range. This applies in particular to wire drawing applications where the load is approximately constant, but does vary slightly due to conditions of wire and lubricants.

★ ★ ★

ONE objection to attempting to run this type of a motor over a large speed range is the power loss which must be dissipated in the controller's resistors under such an operating condition. For example: a fifty horsepower motor running at half speed and drawing full current from the line, would deliver only twenty-five horsepower to the load and twenty-five horsepower would be dissipated in heat in the resistors. This is a large loss in power and would require a larger than average resistor to dissipate it.

★ ★ ★

THE wound rotor motor with a controller properly designed to give it the right characteristics, can be considered an excellent single speed drive for many wire drawing applications. If the product being drawn is not critical with respect to an exact speed then it can be used with several gear changes to cover wide ranges of products.

★ ★ ★

SEVERAL other types of alternating current motors have been tried out or proposed. In general they have been discarded for

other systems. Mention should be made of the combination of devices using an alternating current motor driving through either an eddy current clutch or a hydraulic system.

★ ★ ★

THE eddy current clutch drive gives a speed torque characteristic similar to that which can be obtained with the wound rotor motor but control is lacking on deceleration and stopping.

★ ★ ★

THIS clutch can be controlled to run the machine at slower than motor speed, but the power waste on large reductions increases the size of the clutch in many applications. This type drive applied to some special applications other than the drawing of wire has had a great deal of success and is quite common.

★ ★ ★

PREVIOUSLY the author stated that the alternating current squirrel cage motor was the work horse of our entire industrial world. But that was not always so. Industry started with the direct current motor. The heavy industries, such as steel, took the direct current motor and made it an integral part of its entire growth. This is understandable, because in the early days both the steel industry and the electric motor were growing in ability, and steel needed motors of all kinds and sizes to manipulate steel, run power cranes, and do all the other heavy jobs that were necessary.

★ ★ ★

AT that time, one point in particular made the difference and it was basic. The rotor of the alternating current motor got hot, if started and stopped too frequently. The direct current motor could be started and stopped indefinitely on the same duty cycle without overheating.

★ ★ ★

THE direct current motor of course is built both as a shunt and as a series motor. While the series motor has many applications such as cranes, heavy manipulator operations, etc., it is seldom used directly on wire drawing. We will consider the shunt and compound wound motors primarily.

★ ★ ★

THE shunt motor, which has a small series winding to give it stability has these inherent characteristics. An operating speed with a slight droop based on the strength of the shunt field, and on the voltage applied to the terminals of the motor. A pull-out torque limited by its commutations limit, which is slightly over double full load current on an industrial motor, and the motor will develop a back voltage as long as it is turning and the field energized. It cannot be said to have a starting torque of its own from any bus voltage, because if it were thrown across a main bus it would immediately flash over.

★ ★ ★

THIS direct current motor with a controller to regulate its action can develop an extremely wide range of operating characteristics, the main ones could be summarized as follows; the starting torque can be regulated by the controller so that its average is about 150 per cent of full field torque. It can be made to operate over at least a two to one speed range and up to four to one, if built for the job, by means of rheostats and the necessary field relays to keep the current within commutating limits. Over this entire speed range the operating characteristics are good. For stopping, dynamic braking gives a quick stop within the limits of the torque of the motor.

★ ★ ★

WHEN fast starting and stopping are required, the heat put into the direct current motor consists only of the resistance losses. The system energy which, in the case of the alternating current motor went into the rotor, is put instead into the starting resistor. In the case of stopping, the energy of the system is put into the dynamic braking resistor.

★ ★ ★

THIS direct current motor of course can have its speed torque curves changed to a limited extent by the addition of more series field. This gives a small drop to the speed torque curve at full field speed, and a continually increasing droop as the top speed is raised. This characteristic is highly desirable under certain circumstances.

★ ★ ★

THE consideration of the inherent characteristics of the various types of motors that the author has mentioned, as a whole, leads to the realization that about all any motor can do inherently, with exactness, is to run and give power. It is then, the duty of the controller to start it at the rate desired, to stop it at the rate most desirable, to change its speed, reverse it, change its characteristics, and to protect it.

★ ★ ★

A CONTROLLER, in the usual industrial process, must be designed for every part of the cycle so that the motor is guided through the complete operation as it should be.

★ ★ ★

AS an example of this, a controller on a particular steel wire drawing machine must do the following things to a direct current motor. Some of these functions are done together and some have time intervals between them. When the start button is pressed, the main line contactors are closed, full field is applied, armature shunt is put on the motor, the armature shunt current is increased, the motor field is weakened, the armature shunt is removed, and four accelerating contactors close in succession to connect the motor to the line. The motor is now up to speed and running. When the stop button is pressed, dynamic braking is applied, the field is forced, the second step of dynamic braking is applied, full field is applied and resistance is inserted in the motor field to protect it from over-heating while at standstill.

★ ★ ★

A SIMILAR control may do the same thing with some variations to several motors operating

in train. Of course the other extreme is a starter for a constant speed squirrel cage motor, where the start button closes the contactor, and the stop button drips it out.

★ ★ ★

FURTHER improvement in flexibility in the control of the direct current motor is obtained by the use of the Ward-Leonard system or perhaps better known as the variable voltage system. This system is not new and has been used practically since the start of the use of the direct current motor in heavy industries.

★ ★ ★

IN this system a single generator is used to supply the direct current motor, or in some cases several direct current motors, all of which operate at the same voltage. The controller operates on the field of the generator to accomplish voltage changes on the motor armature in the same manner that contactors and resistors are used when the motor is started from a conventional direct current bus.

★ ★ ★

WHERE no direct current is available, this offers a very satisfactory system on wire drawing equipment, when a wide speed range is required. Also on many of the latest high speed ferrous wire drawing machines, this system allows the field range of the motors to be reduced and gives greater stability to the machine in general. It is extremely flexible and has a definite part in the wire drawing future.

★ ★ ★

IN the past fifteen years the wire drawing industry has made such tremendous strides, that many machines which were installed just before the war are now surpassed as far as speed of production is concerned, by machines which have been, or will be, installed in the near future.

★ ★ ★

EVERY improvement in drawing processes, in lubricants, in machinery, and in metal has increased the motor and control problems.

★ ★ ★

WITH the background of motor and control thinking which has been presented, the general classes of wire mill machinery will be mentioned, and the types of control and drives which appear to be able to do the various jobs required will be discussed. In many cases the choice of alternating or direct current may depend entirely on the availability of this power.

★ ★ ★

IN general, alternating current power is most economical, because direct current usually has to be obtained by conversion. However, in many plants direct current is available in a satisfactory capacity and costs are not excessive.

★ ★ ★

PROBABLY the most common block used everywhere, is the single spindle, one or two dies, breakdown block, commonly called the bull block. It is generally conceded that a direct current motor is best suited for this purpose. The controller used on such a block has been standard for a good many years, and consists of two points of armature shunt, and a total of six accelerating points. The controller has a unique connection for a slow speed reverse.

★ ★ ★

ESSENTIALLY this controller, through the two armature shunt points, gives the motor a slow starting speed, whether lightly or heavily loaded, the unusually high number of accelerating points is easily justified by the smoothness of acceleration obtained on either a heavy or light load. The direct current motor usually has an extra intermittent series field to obtain extra torque at starting. The standard speed ranges are three and four to one. Acceleration above base speed of the motor is accomplished by a field accelerating relay.

★ ★ ★

IN plants where direct current is not available a similar system has been used, using a generator to drive the motor, the accelerating features being accomplished by contactors in the generator field. Some of these are working and doing a very satisfactory job. The economics of over all operation appear to point to the use of the variable voltage system if a single block is being installed. If a plant is going to install two or more bull blocks, then the installation of one generator to drive all of the blocks appears to be the most satisfactory and economic method.

★ ★ ★

ROD machines, such as are used in the non-ferrous field, driven by a single motor present a major problem in economics if everything is taken into consideration. The majority of these installed at the present time and those which will be installed are driven by wound rotor motors.

★ ★ ★

SINCE the horsepower is usually quite large, varying from 150 to 250 horsepower, the controller naturally involves rather large contactors. All of these use a main line and five accelerating contactors giving a total of six points of acceleration. The starting torque is limited by the resistor to approximately 150 per cent of full load torque.

★ ★ ★

SOME special arrangement should be made for limiting the speed during threading. One, being installed, is as follows: when an operator first starts to thread one of these machines, the motor can accelerate to full speed without danger to the operator. As he gradually threads the dies, the speed becomes higher and more dangerous. A system of voltage relays in the motor circuit allow the operator to select the top jogging speed of full, one-half or one quarter speed. We believe that this system or a similar one will be standard equipment on future installations.

★ ★ ★

DIRECT current motors are used to drive these machines also and of course operating characteristics obtained with the alternating current motor and its controller can be duplicated. Also the direct

(*Please turn to page* 617)

Handling Wire and Wire Products With Industrial Trucks

By

G. B. DAVIS

Sales Manager, Baker Industrial Truck Div. of Baker-Raulang Company

Cleveland, O.

A paper presented before the Canadian Regional Meeting of the Wire Association at Montreal, Canada, April, 1949.

THERE have been two motivating factors responsible for the development and growth of the materials handling industry since the first industrial truck was built more than three decades ago. One of these factors is the necessity for industry to reduce the total cost of the manufactured article directly traceable to handling which adds nothing to the product itself and the other factor is the safety consciousness which has been growing by leaps and bounds in all modern industrial plants. This is not a paper on safety so this phase will not be discussed although it should be mentioned that 270 million man days of production are lost each year to accidents to workers and this is equivalent to the yearly output of about as many workers as live in a city the size of Detroit. The cost of these accidents runs close to two and a half billions of dollars annually and 24% of all of them are the result of handling operations. The handling alone of raw or unfinished products accounts for 20% of all occupational injuries to arms, 31% to hands and fingers, 25% to fingers and toes and 50% of the injuries to the trunk of which 30% are hernia injuries. It is therefore very simple to explain how any manual handling job that can be eliminated with the use of an industrial truck eliminates the chances for these terrifically expensive accidents.

★ ★ ★

THE part which an industrial truck plays in reducing handling costs is probably perfectly obvious but can be quickly and simply shown by the comparison between hand methods and mechanical methods no matter what type of product is considered. A simple problem of moving a pile of 1000 cases a distance of 200 feet and repiling serves as a simple analogy. The simple manual operation consists of one man picking up one case which constitutes a practical load and walking 200 feet in one minute which necessitates 1000 round trips consuming 2000 minutes or 33.33 hours. Figuring labor costs at $1.00 per hour it is costing $33.33 for transporting the 1000 cases. This same man piling at an estimated rate of 200 cases per hour consumes 5 hours in piling the 1000 cases and at the same labor rate adds an additional $5.00 to the above figure.

★ ★ ★

IF this same workman is permitted to put the cases on a two-wheel truck he probably can carry 5 cases per trip. In this case, however, he piles twice, once on the truck and once on the final pile. Thus, the piling time is doubled but the travel time is divided by 5. With this method the operation has consumed a total of 16.6 man hours at a total labor cost of $16.60.

★ ★ ★

IF we increase the unit load for the travel by providing our man with a four-wheel truck capable of carrying 20 cases we have the same piling time as with the two-wheel truck but our travel time is one-quarter of that with the two-wheel truck and we find the total for 200 feet of travel to be .6 man hours. This reduces the handling cost to $11.60.

★ ★ ★

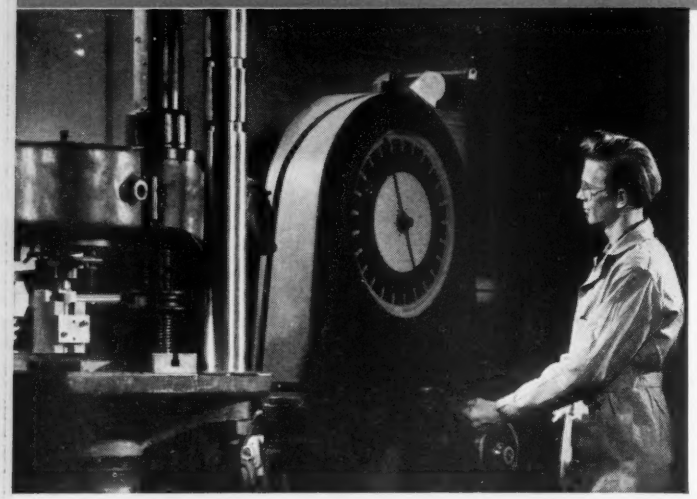
NATURALLY, the travel in each of these cases could be accomplished by a conveyor and under certain conditions the conveyor is one of the most useful tools we have. In this case we require 5 hours to pile the material on the conveyor and 5 hours to pile it from the conveyor to the new location. Transportation of man hours being zero we arrive at a total labor cost of only $10.00.

★ ★ ★

NOW we come to the method in which we make our pile at the source of our first operation and move a whole section of the pile successively to new locations eliminating the necessity for repeated handling of the individual packages. In this case we have one piling operation involving 5 hours piling on pallets. Travel time is greatly reduced inasmuch as one man on a fork truck can handle two or more times as many cases per trip and operates twice as fast. The travel portion of this method is almost negligible as is the time spent in repiling which simply consists of depositing the unit load. This is an estimated .4 hours bringing the total man hours for this method to 5.4 at a total cost of $5.40.

★ ★ ★

THERE is, of course, one more advancement which consists of having the goods delivered on



You can save because of the quality of the dies. Constant testing of Carboloy Cemented Carbides and of Carboloy dies means that Carboloy dies will maintain greater accuracy for you—longer. Continued research gives you tangible benefits in longer die life and greater tonnage . . . dollars-and-cents benefits!

You can save through faster delivery of standard Carboloy dies! No matter which metal-working area your plant is in, there's a complete local stock of standards nearby—in Detroit, Los Angeles, Chicago, Pittsburgh, and Newark. You'll lose no time waiting for replacements—a phone call will bring immediate delivery!

You'
expe
with
able.
in D
costs

FIVE WAYS CARBOLOY— AND CARBOLOY WIRE DIES —CAN SAVE YOU MONEY

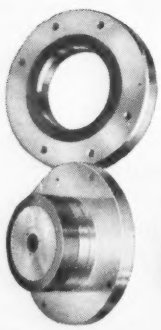
Special round-hole dies

Standard guide rings

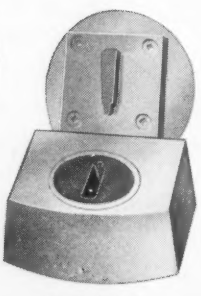
Standard extrusion dies

Standard round-hole dies

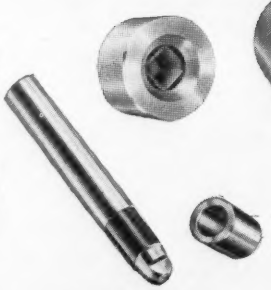
Special shape dies



Round blanking and punching dies

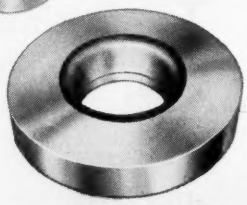


Formed dies and punches

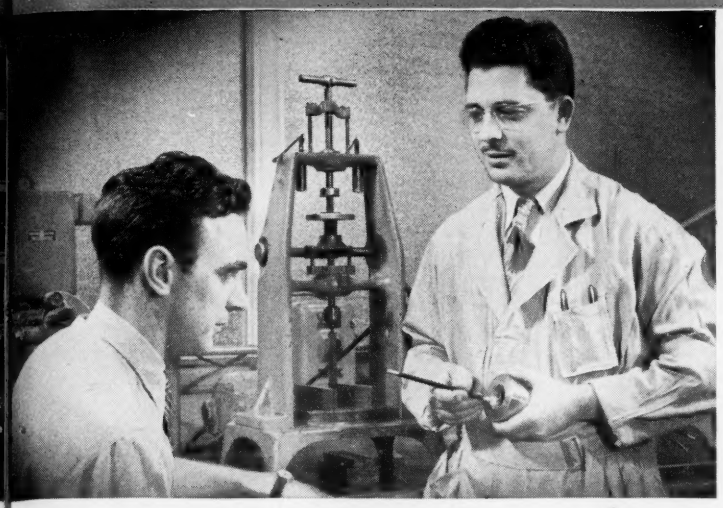


Standard mandrels and mandrel nibs

Standard square and hex dies



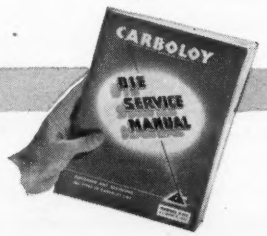
Special sheet-metal drawing, forming, cupping dies



You'll save through expert assistance. Carboloy field engineers, experienced in wire-die problems of all kinds, will help you with any servicing or finishing question. They're always available. And completely equipped Carboloy die service centers in Detroit, Thomaston, and Pittsburgh will help you cut your costs, too.

You can save through better-trained personnel! Carboloy's Die Training School in Detroit is maintained specially to help you keep your men informed about the latest cost-saving methods of carbide-die application and maintenance. The training courses are free, include free training literature. For veteran *or* new personnel!

1. **Carboloy's tested quality brings you bigger profits through longer die life . . . lower costs through fewer die replacements.**
2. **Carboloy's complete local stocks bring you bigger savings through faster deliveries . . . help you meet tight schedules.**
3. **Carboloy's field engineers and die service centers bring you free technical assistance to help you keep production high and costs low.**
4. **Carboloy's Die Training School helps you keep your die-room personnel informed about the latest cost-saving die methods.**
5. **Carboloy's free technical literature helps your personnel keep die application and finishing costs to a minimum. Clear text and diagrams.**



SEND FOR THIS ***FREE***
DIE SERVICE MANUAL

CARBOLOY®
CEMENTED CARBIDE

CARBOLOY COMPANY, INC., 11171 E. 8 Mile Road, Detroit 32, Mich.

Gentlemen: Please send me, free, a copy of the helpful DIE SERVICE MANUAL D-119, containing useful information on die servicing and application.

NAME_____

COMPANY_____ TITLE_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

pallets and placed in storage with a fork truck. In this case there is zero piling time and if we bring our method of moving the 1000 cases from one pile to another pile 200 feet distance down to the .4 hours we have a total labor cost of 40c. We do, of course, in this case as well as the one above have the cost of the equipment to be considered. As the annual cost of owning and operating a fork truck and pallets amounts to $980.00 a year, the per hour cost for .4 hours is only .196 making a total cost of .596 cents as compared to $38.33 for the same operation accomplished by hand handling methods.

★ ★ ★

THE first self-loading industrial truck was built in 1915 and was a lowlift platform unit which ran its platform under skids or skid boxes into which material of all sorts had been piled. When the platform was elevated the truck was then able to carry its load freely to the destination where it was deposited by lowering the platform of the machine. These trucks still have a wide application in industry. We have platform lift trucks of the high-lift and low-lift type handling special skid platforms and racks in which coiled wire is strung.

★ ★ ★

ANOTHER user of hylift platform trucks has made an interesting adaptation which permits the handling of coils and the handling of large spools or reels. This manufacturer of wiring cable and conductors uses these trucks when not engaged in conventional skid platform handling to handle wire in coils by attaching a 10 foot long piece of railroad "T" rail to the platform and covering it with a piece of automobile tire casing to protect the coils from unnecessary abrasion. This modified ram truck is of great assistance to the manufacturer in unloading 250 lb. coils from incoming railroad cars. Originally these coils of wire were placed manually on the platform of the truck, moved to the storage area and then manually unloaded. This operation took 4-½ man hours per car. By adapting the "T" rail device to the truck the car unloading job has been reduced to a total of 3 man hours. The second plant devised attachment consists of two small "I" beams which are attached to the platform truck and at the far end of which is a seat for a round rod or mandrel which is thrust through the center hole of a spool of wire so that it can be picked up by the two "I" beams affixed to the truck's platform. The manufacturer's finished product on these reels or spools is in this manner loaded onto highway trucks for shipment and the loading operation which consists of placing 15 reels in the truck takes less than 30 minutes.

★ ★ ★

LOCOMOTIVE type cranes are frequently used for handling wire in coils, particularly wire rod. Most of our installations of this nature consist of using the crane truck with a hairpin hook for the unloading of wire rod in coils from gondola cars and the storage of this material in outdoor or enclosed areas. The crane truck is a very versatile machine in that it can extend its boom from 12 ft. to 19 ft., has 4 individual motions which consist of travel, hook-hoist, boom-hoist and slew and therefore can pick up its load over the side without turning the truck in the aisle. These cranes have rated capacities varying from 1-½ ton to 5 ton and in addition to their regular jobs can be used by millwright gangs for a wide variety of plant maintenance purposes.

★ ★ ★

TODAY'S most popular industrial type vehicle is the fork truck. The fork truck differs from the burden carrying and self loading platform trucks in that it carries its load outboard or cantilever. It is therefore necessary to counterweight a fork truck a sufficient amount to counterbalance the overturning effect of the load and still provide adequate weight on the steerable wheels to insure stability, friction for steering and a safety factor against possible overload conditions. Fork trucks vary in capacity from 1000 lbs. to 30,000 lbs. but only the intermediate capacities are found handling wire or wire products. Many 4000 lb. fork type trucks are equipped with tubular or fabricated rams which engage coils of wire or wire rod and pick up and transport multiple coils with ease. Although the popularity of the fork type truck has really become nationwide only since the war, our company built ram trucks 25 years ago, the first of which was put into service February 13, 1923 at Trumbull Steel Company, Warren, Ohio. This cable lift ram truck handles 6,600 lbs. of coil strip and has been on the same job of taking coil steel from the hot strip mill to storage since its installation more than 25 years ago. Today's fork and ram trucks are, of course, better designed for the work they must do, are shorter and therefore more maneuverable and incorporate many features to protect the truck and operator that were not installed on earlier vehicles.

★ ★ ★

ONE of our large wire mills at Cleveland has both a hot mill and cold mill and uses 68 pieces of material handling equipment of all types. The raw material for the hot mill which consists of ingots or billets of various lengths comes in by rail and are usually stacked out-of-doors using overhead cranes and magnets. They are loaded onto flat cars and taken into the mill when needed and are again removed by overhead equipment and put into the furnaces. These ingots are reduced and eventually are wound into a coil inside of a cage which is set up beside a conveyor containing upright spindles. A laborer pulls the coil out of the cage onto one of these spindles and it rides along the conveyor until it is deposited on a steel factory truck or trailer. These trailers are lined up and tractor-trailer trains are then formed to take the hot coils to storage or other processing operations.

★ ★ ★

SOME of this wire is shipped and is next handled by electric crane trucks which pick up the coils and load them directly into

(*Please turn to page* 623)

COME TO CHICAGO for the WIRE ASSOCIATION CONVENTION

LA SALLE HOTEL, OCTOBER 17th to the 20th, INCLUSIVE

An exceptionally splendid and timely program has been arranged under the general chairmanship of Fred M. Crapo, President of the Indiana Steel and Wire Company, from which wire men can derive many benefits.

The Following Subjects will be Covered:

Handling Wire and Wire Products in the Wire Mill
Plastic Strain and Hysteresis in Drawn Steel Wire
Back Pull Wire Drawing
Continuous Cleaning
Processing of Stainless Steel Wire
Symposium on Carbide Dies
Symposium on Diamond Dies

Protective Atmospheres for Annealing Non-Ferrous Wires
The New General Electric Company Copper Mill
The Manufacture of Nickel and Monel Wires
Application of Tin Coating in the Wire Industry
Nylon Insulation

PLANT INSPECTION: Visit to Joliet Mill, American Steel and Wire Company.
FUNCTIONS: Annual Wire Association Luncheon—Mordica Memorial Lecture by Col. Allan B. Dove, Steel Company of Canada, Ltd.
Stag Dinner and Smoker
Wire Association Annual Meeting of Members.

There will be a registration fee of $5.00 for those attending the technical session and informal meetings.

Members should make reservations for rooms at the La Salle Hotel direct to the Secretary of the Wire Association. DO IT NOW, TODAY.

This will be a fine meeting and a large attendance is expected.
DON'T MISS IT !

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary
300 MAIN STREET STAMFORD, CONN.

Wire Association Pacific Coast Meeting

THE Annual Pacific Coast meeting of The Wire Association was held at Los Angeles, California, on Friday, June 3, 1949.

* * *

WITH a registered attendance of 133, the program consisted of a plant inspection trip to the wire mill of the Bethlehem Pacific Coast Steel Corporation in the afternoon, a "get-together" for cocktails and dinner at the Los Angeles Biltmore Hotel, and a technical session.

* * *

ABOUT 90 men went on the plant visit.

* * *

THE dinner and technical session attendance was 131.

AT the meeting, **Wallace G. Imhoff,** President of The Wallace G. Imhoff Company, Los Angeles, California, presented a paper entitled, "The Waste Pickle Liquor Problem." An interesting discussion followed, in which a wide diversity of ideas on the subject were expressed.

* * *

FOLLOWING the paper, two sound motion pictures were shown: **"Voices in Paper,"** from the Western Electric Company, and **"Steel Wire,"** produced by the Bethlehem Steel Company.

* * *

PRIOR to the presentation of the technical program, **Richard E. Brown,** Executive Secretary of The Wire Association and Publisher of WIRE AND WIRE PRODUCTS, outlined the aims and objectives of the Association in a short address.

* * *

THE committee in charge consisted of:

E. N. Coffin, Columbia Steel Co., Los Angeles, Cal., Chairman.
K. H. Davis, Pres., K. H. Davis Wire & Cable Corp., Los Angeles, Cal.
Earl R. Potter, Vice Pres., Industrial Wire Products Corp., Los Angeles, Cal.
G. L. Killian, Mgr., Acme Wire & Steel Co., Los Angeles, Cal.
R. J. Tremblay, Gen. Supt., Bethlehem Pacific Coast Steel Corp., Vernon, Cal.

* * *

THE following is a list of the registered attendance.

* * *

ATTENDANCE LIST

Los Angeles, June 3, 1949

ANDERSON, F. L., Pur. Agt.
L. A. Young Spring & Wire Corp.
Los Angeles, Cal.

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT OFF.

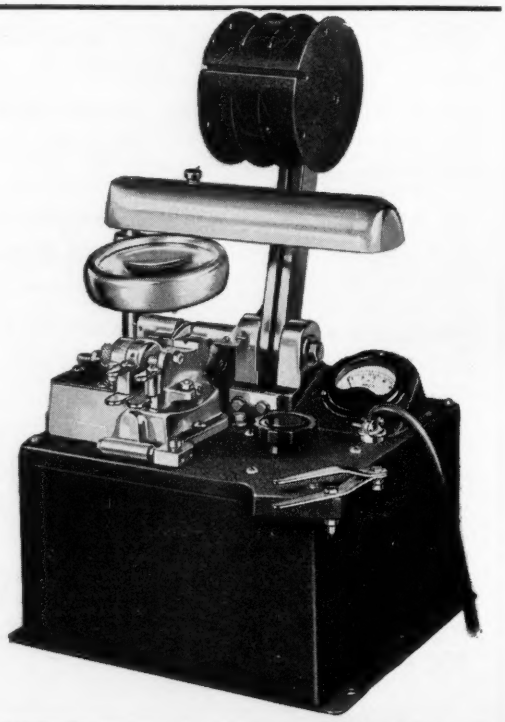
MODEL M-T, FOR BENCH MOUNTING

This welder was designed and developed expressly for welding all types of fine wire: Aluminum, Copper, Brass, Bronze, Steel and Steel Alloys, ranging in size from .005" to .020" diameter.

Unit design of frame, transformer and power sub-assemblies permit other range of sizes to suit requirements.

Equipped with a temperature indicating annealing and tempering device, voltage regulator and meter to compensate for voltage fluctuation, wire cutters, extra large 5" diameter magnifying glass, fluorescent light and extension cord. Welder can be supplied for bench mounting, or mounted on 4-wheel truck.

The adaptability of this unit for welding all types of wire, either ferrous or non-ferrous, in sizes from .005" to .020" diameter, makes it ideal for the fine wire manufacturer.



MICRO PRODUCTS COMPANY
20 NORTH WACKER DRIVE
CHICAGO 6, ILL.
Telephone: State 2-7468

ANDERSON, N., Sales Mgr.
Hollister Coil Spring Co.
Los Angeles, Cal.

BAESSLER, Karl H., Works Mgr.
California Wire Cloth Co.
Oakland, Cal.

BARBATA, V. A., Sales Repr.
Bethlehem Pacific Coast Steel Corp.
San Francisco, Cal.

BARBOR, D. D., Engr. of Tests
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

BARTLETT, E. A.
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

BERLIE, J. Sigmund, Sales Repr.
Metalwash Machinery Corp.
Los Angeles, Cal.

BERRIEN, P., Gen. Mgr.
Russell, Burdsall & Ward Bolt & Nut Co.
Los Angeles, Cal.

BISHOP, G. E. Wire & Cable Engr.
General Electric Co.
Oakland, Cal.

BLEAN, Robert C., Metallurgist
Columbia Steel Company
Torrance, Cal.

BOECK, P. A., Div. Mgr.
Oakite Products, Inc.
Los Angeles, Cal.

BOERSIG, Edward L., Die Sales Engr.
Carboloy Co., Inc.
Huntington Park, Cal.

BONDS, E. E., Asst. Supt.
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

BREENKER, Geo. H., Sales
Industrial Wire Products Corp.
Los Angeles, Cal.

BREHM, Peter J., Sales
Industrial Wire Products Corp.
Los Angeles, Cal.

BROOKS, J. C., Turn Foreman
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

BROWN, Richard E., Pres.
WIRE AND WIRE PRODUCTS (A publication)
Stamford, Conn.

CASAS, Chas. H., Supt.
C. R. C. Company
Los Angeles, Cal.

CASAS, Peter, Foreman
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

CHRISTIE, C. G., Production
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

COFFIN, E. N., Sales
Columbia Steel Company
Los Angeles, Cal.

CONLON, J. F., Office Mgr.
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

COOK, Jay, Chf. Clerk
Republic Steel Corp., Union Drawn Div.
Los Angeles, Cal.

CRAIG, Harvey A., Dist. Sales Mgr.
Republic Steel Corp., Union Drawn Div.
Los Angeles, Cal.

CUSIC, H. S.
Bethlehem Pacific Coast Steel Corp
Vernon, Cal.

DAVIS, K. H., Pres.
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

DRAY, C. W., Pur. Agt.
Pacific Wire Rope Co.
Los Angeles, Cal.

EGAN, J. W., Repr.
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

Keystone's new Galvanized MB Wire offers improved corrosion resistance. It gives added life and strength to mechanical springs subject to rust and corrosion. This is due to Keystone's unique method of galvanizing the wire **before** it is cold-drawn. The drawing process smooths and hardens the galvanized finish, increasing its lasting qualities remarkably. Other advantages are its lustre-bright, shiny smooth finish . . . even, uniform temper . . . and high tensile strength.

Whatever your industrial wire problem might be, Keystone's wire specialists can help solve them for you.

KEYSTONE
MUSIC SPRING WIRE
KEYSTONE STEEL & WIRE CO. PEORIA, ILLINOIS

SPECIAL ANALYSIS WIRE for all industrial purposes

KEYSTONE STEEL & WIRE CO., Peoria 7, Ill.

REELS made of

RETURNABLE AND NON-RETURNABLE **WOOD**

12" to 96" in diameter
for complete reels and

REEL HEADS FOR STEEL DRUMS

Bridge SHIPPING and SHOP REELS are furnished assembled or knocked down, made to your specifications. Built to withstand severest handling. Sturdy, strong, low in cost. Made for

CABLE,
ROPE and
WIRE

and delivered anywhere within a radius of 200 miles of Hazardville by means of Bridge trucks.

This service includes over-night delivery of reels, in case of urgent need, direct to your plant. You are invited to avail yourselves of this unique and convenient facility.

Send us your specifications and let us quote on costs.

BRIDGE MFG. CO., Inc.
HAZARDVILLE • CONNECTICUT

FIGUEROA, J., Supt.
L. A. Young Spring & Wire Corp.
Los Angeles, Cal.

FITZLAFF, Al., Proprietor
Al. Fitzlaff
Los Angeles, Cal.

FLETCHER, Geo. W., Foreman
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

FOSS, Lyle, Sales Mgr.
L. A. Young Spring & Wire Corp.
Los Angeles, Cal.

GLAAB, Paul, Sales
Columbia Steel Company
Los Angeles, Cal.

GOLIO, E., Pur. Agt.
Hollister Coil Spring Co.
Los Angeles, Cal.

GRACE, W. J., Manager
L. A. Young Spring & Wire Corp.
Los Angeles, Cal.

GUESS, Frank, Owner
Abbey-Scherer Co.
El Monte, Cal.

HAGEN, A. M., Plant Mgr.
General Cable Corp.
Los Angeles, Cal.

HANSEN, Harold, Dist. Mgr.
California Wire Cloth Co.
Oakland, Cal.

HARDERMAN, G. H., Sales
Columbia Steel Company
Los Angeles, Cal.

HELLER, R. D., Owner
Heller & Paul
Glendale, Cal.

HENDERSON, H., Vice Pres.
Los Angeles Fencing Co.
Los Angeles, Cal.

HORNER, Cy, Supt.
L. A. Young Spring & Wire Corp.
Los Angeles, Cal.

HOWARD, F. S., Div. Vice Pres.
And Production Staff of 9.
Columbia Steel Company
Los Angeles, Cal.

IMHOFF, Wallace G., Pres.
The Wallace G. Imhoff Co.
Los Angeles, Cal.

INGRAM, Richard C., Field Repr.
Vascoloy-Ramet Corp.
Los Angeles, Cal.

JASON, Harry H., Sales & Serv. Engr.
Carboloy Co., Inc.
Oakland, Cal.

JONES, J. Homer, Vice Pres.
Planett Mfg. Co.
Downey, Cal.

KELLY, R., Machinist
Republic Steel Corp., Union Drawn Div.
Los Angeles, Cal.

KILLIAN, G. L., Owner
Acme Steel & Wire Co.
Los Angeles, Cal.

KLOPSCH, Otto Z., Work Mgr.
Phelps Dodge Copper Products Corp.
Los Angeles, Cal.

KREIDER, Leo G., Supt. Inspection
General Cable Corp.
Los Angeles, Cal.

LAWLER, Wm., Pur. Agt.
Russell, Burdsall & Ward Bolt & Nut Co.
Los Angeles, Cal.

LOMBARDI, Gerald, Foreman
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

LUHRS, A. F., Supt.
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

MADISON, V. E., Wire Mill Foreman
Anaconda Wire & Cable Co.
Orange, Cal.

(*Please turn to page* 612)

Outstanding Personalities of the Wire Industry

Firth Sterling Elects Kinnear as President

J. W. KINNEAR, JR., has been elected President of **Firth Sterling Steel and Carbide Corporation**, manufacturers of high speed steel and cemented carbides. The promotion follows Mr. Kinnear's service as Executive Vice President for nearly two years and Director for 15 years. Mr. Kinnear will actively direct the operations of Firth Sterling. He succeeds L. G. Firth, who has been President since 1933.

★ ★ ★

DURING the war, Mr. Kinnear figured prominently in the development and production of armor plate as a member of the Army's and Navy's Ordnance Armor Plate Steering Committees. He was Chairman of the Army Committee. At the time, Kinnear was Assistant Manager of Operations for Carnegie-Illinois, Pittsburgh District.

★ ★ ★

MR. Kinnear is the son of one of the founders of Firth Sterling Steel and Carbide Corporation, J. W. Kinnear, Sr., who with Lewis Firth founded the Firth Sterling Steel Company in 1896.

★ ★ ★

ANNOUNCEMENT has also been made of the election of **Kenneth D. Mann** at a special meeting of the Directors to the Chairmanship of that body. Until recently, Mr. Mann was Vice President of the Reynolds Metals Company, prior to which he was with the Republic Steel Corporation.

J. W. Kinnear, Jr., Pres. Firth Sterling Steel & Carbide Corp., McKeesport, Pa.

★ ★ ★

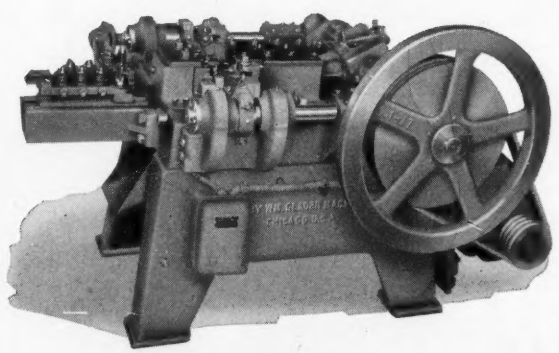
Standard Varnish Works Announces Appointments

M. H. CORBIN, President, has announced the appointment of **Carl Bauer** as Manager of Industrial Sales and **W. E. Santoro** as Director of Laboratories of **Standard Varnish Works** of New York.

★ ★ ★

CARL BAUER, a graduate Chemical Engineer, started with the Company as a chemist, later becoming Director of Research and then Director of Laboratories. In addition to his contributions to the development of industrial finishes, he has lately

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS
210 No. Racine Ave.
Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

been increasingly active in sales development work. In January, 1949 he was made a Director of Standard Varnish Works of New York.

★ ★ ★

MR. Bauer has been active in the finishing industry for many years and has contributed technical articles to various publications, including Wire & Wire Products. He is a member of the American Chemical Society and The Paint and Varnish Production Club of New York.

★ ★ ★

W. E. SANTORO came with Standard Varnish Works in 1939, to take charge of the Company's Metal Decorating Division. He has had many years of experience in the paint and varnish industry and has made numerous contributions to the technological advancement of the industry.

★ ★ ★

Swift Represents Wm. M. Parkin Co.

THE WILLIAM M. PARKIN COMPANY of Pittsburgh, Pennsylvania, manufacturers of pickling inhibitors, accelerators, and foaming compounds, announce the appointment of **John A. Swift,** Manager of The Swift Industrial Chemical Company, Hartford, Connecticut, as their representative in New England. Mr. Swift has had long experience in the wire industry in New England having served with the Halcomb Steel Company, Western Electric Company, American Steel & Wire Company, Billings and Spencer Company, and recently as technical director of the Heatbath Corporation of Springfield. He is a graduate of M.I.T. receiving S.B. and S.M. degrees in Electrochemical Engineering.

John A. Swift, New England Representative of the Wm. M. Parkin Co. of Pittsburgh, Pa.

★ ★ ★

MR. Swift is a member of the American Society for Testing Materials, American Chemical Society, American Society of Tool Engineers, American Institute of Mining and Metallurgical Engineers, and the American Society for Metals. He is a Past Chairman of the Hartford Chapter A.S.M.

★ ★ ★

L. S. Howe Made Director of Engineering for Glenn L. Martin Chemicals Division

APPOINTMENT of **Llewellyn S. Howe** as Director of Engineering at the manufacturing plant of **The Glenn L. Martin Company's**

Controlled

OPERATING TEMPERATURES TO 650° F

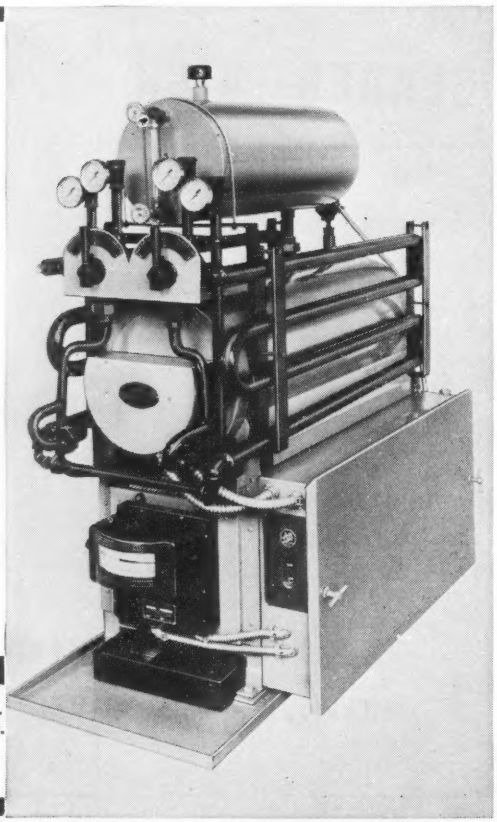
The Royle Temperature Control Unit is designed to eliminate uncertainty in extrusion and other industrial processes which require accurate and constantly maintained operating temperatures of extended periods of time. This compact and simply operated unit will supply—or drain—heat in accordance with process specifications as established by laboratory experiments. Features are built into the self-contained Royle Temperature Control Unit to assure maximum results with a minimum of maintenance.

WRITE FOR COMPLETE DETAILS

JOHN ROYLE & SONS ROYLE PATERSON N. J.

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN 1880

London, England	Home Office	Akron, Ohio	Los Angeles, Cal.
James Day (Machinery) Ltd.	E. B. Trout J. W. VanRiper	J. C. Clinefelter	H. M. Royal, Inc.
REgent 2430	SHerwood 2-8262	JEfferson 3264	LOgan 3261



Chemicals Division, Painesville, Ohio, has been announced by Robert H. Kittner, Vice President in charge of this division.

★ ★ ★

MR. Howe brings many years of intensive experience to his job of supervising all engineering design and development work at this $6,000,000 plant, which last year began commercial production of the Martin Chemicals Division's polyvinyl chloride-type resin, Marvinol.

★ ★ ★

FOR twelve years, Mr. Howe was identified in various capacities with the Atlantic Refining Company at Philadelphia. In 1947, Mr. Howe joined the Chemical Division of Orr & Sembower, Inc., at Reading, where he directed chemical and mechanical engineering activities.

★ ★ ★

Oakite Products, Inc., Elects New President

AT the recent annual meeting of the stockholders and employees of **Oakite Products, Inc.,** New York manufacturers of industrial cleaning and allied materials, announcement was made by the Board of Directors of the election of **John A. Carter** as President of the Company. The new chief executive has been associated with the Oakite organization for 34 years, serving in recent years as Assistant to the President and, since December 1947, as General Manager of the Company.

★ ★ ★

D. C. **BALL,** founder and President of Oakite, and long a pioneer in the development of specialized cleaning materials for industry, was elected Chairman of the Board. Also announced at the meeting was the election of **David S. Ball,** former Vice President, to the newly created office of First Vice President, as well as the re-election of **H. Liggett Gray** as Vice President, **James Beckett** as Treasurer, and **David A. Hearn** as Secretary.

★ ★ ★

Special Assistant to Fiberglas General Sales Manager Appointed

APPOINTMENT of **E. W. Pat Smith** as special assistant to the general sales manager of **Owens-Corning Fiberglas Corporation** is announced by **Ben S. Wright,** general sales manager.

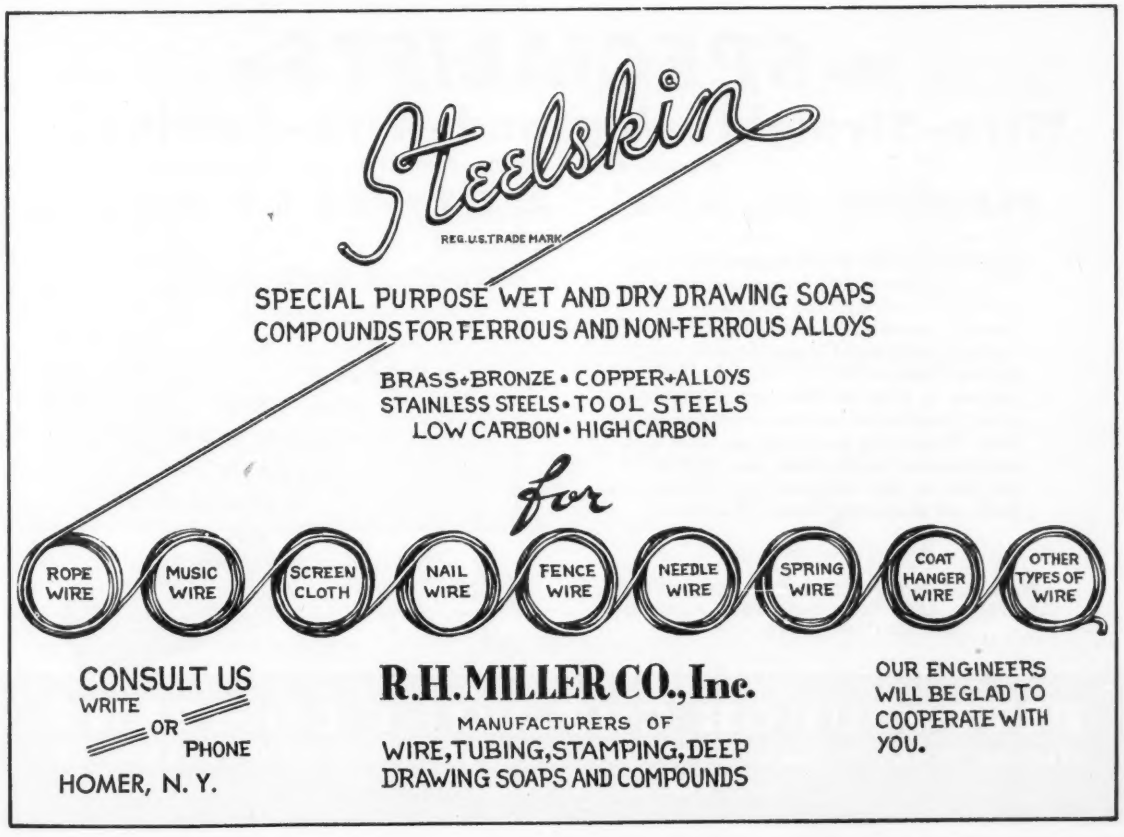
★ ★ ★

UNTIL recently Mr. Smith was vice president for sales of Philip Carey Manufacturing Company. Previously he served in various sales capacities with the Johns-Manville Corporation and Certain-teed Products Corporation.

★ ★ ★

MR. Smith is president of the Asbestos-Cement Products Association, past chairman of the board of governors of the Asphalt Roofing Industry Bureau, a committeeman of the Producers' Council, and a director of the National Mineral Wool Association.

★ ★ ★



A Review of Recent Wire Patents

NO. 2,468,821, BRAD, patented May 3, 1949 by Charles B. Goodstein, Newton Highlands, Mass.

This brad has a straight cylindrical shank uninterrupted by recesses but has projections thereon only at one end, these projections extending diametrically from the shank and being of a thickness less than one half the diameter of the shank, with the outer end of each of the projections being rectangular in both transverse and longitudinal cross section.

★ ★ ★

NO. 2,469,150, WIRE COATING COMPOSITIONS, patented May 3, 1949 by Willis E. Boak, Burton, Ohio, assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

A rust-resistant coating is provided for iron wire and consists of:

Soft red iron oxide	140 lbs.
Fibrous magnesium silicate	38 lbs.
Litharge	19¼ lbs.
Aluminum stearate	1 to 4 lbs.
Congo-linseed oil varnish of 15 gallon oil length	80 gallons
Varnish Maker's and Painter's Naptha	12½ gallons

★ ★ ★

NO. 2,469,169, STRIP GUIDE, patented May 3, 1949 by Glenn R. Markle, Pittsburgh, Pa., assignor to Carnegie-Illinois Steel Corporation, a corporation of New Jersey.

Roll changes may be made without the necessity of removing these new guides from the rolls.

★ ★ ★

NO. 2,469,175, MATTRESS, patented May 3, 1949 by Louis Paransky, Pittsburgh, Pa., assignor to The Star Bedding Co., a partnership.

While the construction includes rows of coil springs, the invention resides in the disposition of lengths of rope, tying the springs together.

★ ★ ★

NO. 2,469,216, SUSPENSION SPRING SEAT, patented May 3, 1949 by Leo Spunt, Detroit, and Bruce A. Gould, Highland Park, Mich., assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware.

This construction employs a number of upwardly-arched sinuous wire springs extending crosswise of the frame, a spring-suspended hammock or sling suspended from the frame and extended over the arches to cooperate with the arches for yieldably supporting the load, this hammock comprising webbing and tension springs suspending the webbing from the sides of the frame.

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

★ ★ ★

NO. 2,469,596, SPRING, patented May 10, 1949 by Percy Glenn Groom, Hamilton, Ontario, Canada.

A compression spring is disclosed comprising a single length of wire formed to provide a pair of spirally wound ends, a number of normally, widely spaced helical coils centrally between these ends, the helical coils being of equal diameters, and other helical coils between the central coils and ends being of gradually increasing diameters; in combination with a core of sponge rubber having a cross sectional area at its central portion as great as the area surrounded by the central portion of the spirally wound spring structure and having these central helical coils embracing the core to compress it on a helical line.

★ ★ ★

NO. 2,469,721, ELECTRICAL CABLE COMPOSITION, patented May 10, 1949 by Philip Tucker Gidley, Fairhaven, Mass., assignor, by mesne assignments, to Standard Oil Development Company, a corporation of Delaware.

Vulcanized dielectric material is described in this patent consistently predominantly of a homogeneous blend of

The SPECIALISTS in
Wire - Straightening and Wire - Cutting!

Diameter Range — 1/16" to .005"

PRECISION - Our Motto

DON'T hesitate to call on us when you are confronted with wire-straightening problems involving close tolerances and absolute accuracy. For seventeen years we have specialized in straightening and cutting all gauges of fine wire, hard or soft, ranging in diameter from one-sixteenth of an inch down to five-thousandths of an inch. We employ gun-barrel accuracy in straightening lengths from one inch to ten feet or any fractional part thereof. Ends cut absolutely clean without burrs.

ASK ABOUT OUR UNEXCELLED FACILITIES FOR CLEANING AND POINTING WIRE ALREADY STRAIGHTENED AND CUT.

ALL TYPES OF WIRE...

- Nickel
- Stainless Steel
- Bronze
- Brass
- Copper
- Alloy Wire
- Music Wire
- Tag Wire
- Florist Wire

Write us today!

Manufacturers of the famous ARMA PAPER CLIP

PITTSBURGH CUT WIRE COMPANY
1112-20 GALVESTON AVENUE · PITTSBURGH, PENNSYLVANIA.
TELEPHONE: CEdar 4702

a rubbery butadiene acrylic nitrile copolymer and a hard, tough, thermoplastic resin consisting of polymerized vinylidene chloride.

★ ★ ★

NO. 2,470,075, MACHINE FOR MARKING WIRE, CABLE, RODS, AND THE LIKE, patented May 10, 1949 by Charles F. Robbins, Keene, N. H., assignor to Markem Machine Company, Keene, N. H., a corporation of New Hampshire.

This machine is adapted to mark or imprint the wire at opposite sides thereof and throughout its length.

★ ★ ★

NO. 2,470,331, MACHINE FOR LAPPING WIRE DRAWING DIES, patented May 17, 1949 by Paul Bieberich, Fort Wayne, Ind.

The lapping machine consists of a rotatable die mount having supported connection with a support, a device on the support for axially adjusting the mount, a guideway supported on the support provided with means for adjusting the guideway upon an axis that intersects at right angles the axis of the mount, a jig mounted in the guideway having longitudinal reciprocating movement therein, provided with a lapping wire that extends through the bore of a die compact supported on this mount and which extends in a plane parallel to that of the movement of the jig.

★ ★ ★

NO. 2,470,651, POLYMERS OF CONDENSATION PRODUCT OF ARYL DIETHER DICARBOXYLIC ACID AND DIHYDRIC ALCOHOL, patented May 17, 1949 by Gerson S. Schaffel, Pittsburgh, Pa., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania.

Essentially this product (a dielectric for cables) contains a thermosettable polyester derived by heating a dihydric alcohol having no reactive groups other than the hydroxyl groups and resorcinol-0, 0-diacetic acid in the presence of a catalyst consisting of zinc chloride, sulfuric acid, aluminum chloride, antimony flouride, antimony chloride, or boron trifluoride until condensation therebetween and cross-linking of the condensation product has occurred, the proportions of said alcohol and acid being stoichiometrically equal.

★ ★ ★

NO. 2,470,812, MACHINE FOR ASSEMBLING SPRINGS, patented May 24, 1949 by Joseph Gauci and Daniel Krakauer, Brooklyn, N. Y., assignor to Kay Manufacturing Corporation, Brooklyn, N. Y., a corporation of New York.

A one-cycle (or one-revolution) type machine is provided for forming and tying the helical tie wires around the adjacent prearranged rows of coil springs and severing the wires at the proper time.

★ ★ ★

NO. 2,471,469, WIRE LAPPING OR LIKE MACHINE, patented May 31, 1949 by Wilfred John Lee Wildbore and James McConnochie Keenan, London, England, assignors, by mesne assignments, to International Standard Electric Corporation, New York, N. Y., a corporation of Delaware.

More specifically, the invention embodies a lapping head having a hollow-head driving spindle, a rotary head thereon, a second spindle co-axially mounted within this first spindle and extending therethrough, a spreader mounted on the second spindle, a device for coupling the spindles together for rotation, and a device for adjusting the position of the spreader from below said rotary head while the latter is rotating.

★ ★ ★

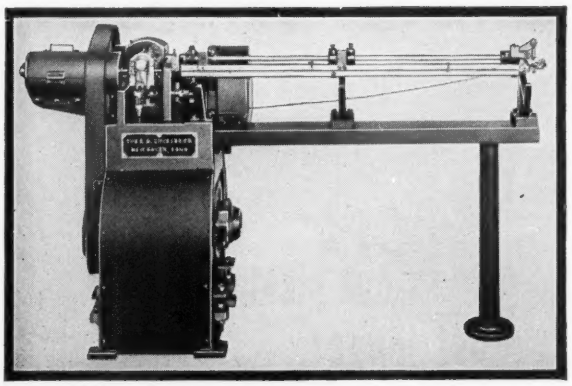
NO. 2,471,889, RUST PREVENTIVE COMPOSITIONS, patented May 31, 1949 by Miriam A. Paliwoda, Bayonne, and Gordon W. Duncan, Westfield, N. J., assignors to Standard Oil Development Company, a corporation of Delaware.

This consists essentially of a major proportion of volatile hydrocarbon having a flash point between 90° and 120° F., a plasticizer, and 5 to 25% of an ester of a polyhydric alcohol consisting of pentaerythritol or polypentaerythritol, this ester containing one esterifying radical of a saturated fatty acid having from 12 to 22 carbon atoms and three radicals of saturated carboxylic acid having 1 to 4 carbon atoms.

★ ★ ★

NO. 2,471,907, METHOD OF AND MATERIAL FOR INCREASING

Automatic WIRE STRAIGHTENING and CUTTING MACHINES



SHUSTER WIRE STRAIGHTENER TYPE A
Wire Capacity .025 - 1/16" Diameter

High speed, direct driven 5-die straightening flier with precision cut-off that assures undistorted, square cut ends. Efficient V-belt motor drive, ball and roller bearings throughout, extremely rigid construction.

Shuster Wire Straighteners are available for wire up to 11/16" diameter.

Write for catalog.

Prompt Delivery

METTLER MACHINE TOOL, INC., *Shuster Wire Machine Div.*, 132W Lawrence St., New Haven, Conn.

SHUSTER *Automatic* *Since 1866* WIRE STRAIGHTENING AND CUTTING MACHINES

THE CORROSION RESISTANCE OF FERRIFEROUS METALS, patented May 31, 1949 by Eugene Snyder, Philadelphia, Pa. assignor to American Chemical Paint Company, Ambler, Pa., a corporation of Delaware.

A surface coating is provided by treating the surface with a bath the essential coating-producing ingredients of which consist of an aqueous solution of phosphate of alkali metals or ammonium, this solution also containing from about 0.0005% to 0.05% by weight of the total treating solution of soluble chlorite calculated as $NaClO_2$ and pH of the solution being from approximately 4.5 to approximately 6.5.

★ ★ ★

NO. 2,471,970, WIRING DEVICE, patented May 31, 1949 by Herman A. Miloche, Teaneck, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York.

A wire distributing device is disclosed comprising a trough adapted to accommodate wires therein, recessed passageways in the inner surfaces of the side walls of this trough opening outside the outer layers of the wires and continuing as holes through the bottom of the trough, the passageways and holes provided for the accommodation thereby of the wires.

★ ★ ★

NO. 2,471,973, TAPE SUPPORTING MEANS FOR STRAND COVERING MACHINES, patented May 31, 1949 by Axel C. Nystron, Rutherford, and Walter J. Volckhausen, Teaneck, N. J., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Apparatus is set out in this patent for supporting a pad of tape-like material and rotating the material about an axis coincident with the longitudinal centerline of the material pulled from the pad.

★ ★ ★

Wire Association Pacific Coast Meeting

Attendance List

(*Continued from page 606*)

MARTINES, Irving G., Sales
Columbia Steel Company
Los Angeles, Cal.

McCRACKEN, Mr., Chief Shipper
Republic Steel Corp., Union Drawn Div.
Los Angeles, Cal.

MEHL, Chas. R., Owner
Industrial Compounds Co.
Los Angeles, Cal.

MIHOLICH, Joseph L., Supt.
General Electric Co.
San Francisco, Cal.

MILLER, Henry Production Mgr.
Russell, Burdsall & Ward Bolt & Nut Co.
Los Angeles, Cal.

MOHR, A. M., Supt.
California Wire Cloth Co.
South San Francisco, Cal.

MORCH, Victor E., Salesman
California Wire Cloth Co.
Oakland, Cal.

MORRIS, Guy, Chemical Engr.
Morris Stamping & Mfg. Co.
Los Angeles, Cal.

MORRIS, J. C., Jr.
Aluminum Co. of America
Los Angeles, Cal.

NEUHART, J. H., Pres. & Prod. Staff of 13
California Spring Co.
Los Angeles, Cal.

NEVINS, J. W.
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

NIXON, James M., Office Mgr.
California Wire Cloth Co.
Oakland, Cal.

OBERLAENDER, B. H., Plt. Mgr.
Kay Mfg. Corp.
Los Angeles, Cal.

O'CONNELL, F. D., Pur. Agt.
Wire & Metal Mfg. Co.
Los Angeles, Cal.

OLSEN, A. A., Supt. Wire Mill
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

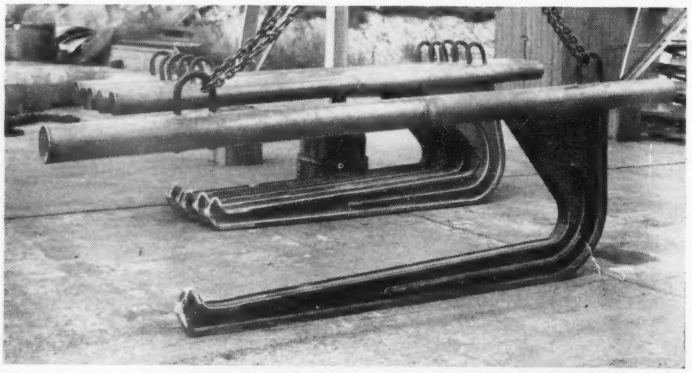
PARKHURST, J. W., Dist. Mgr.
Magnus Chemical Co.
Garwood, N. J.

PAUL, Martin L., Secy.
Heller & Paul
Glendale, Cal.

PERKINS, A. D., Mgr.
Hollister Coil Spring Co.
Los Angeles, Cal.

PLANETT, Earl C., Owner
Planett Mfg. Co.
Downey, Cal.

Hairpins
THAT LIFT TWO TONS



WELDCO lightweight **hairpin hooks cut pickling costs . . . resist corrosion . . . last longer**

These hairpin pickling hooks, recently shipped to a leading Eastern wire mill, measure 14 feet in length, and each can handle 4200 pounds of coiled steel products at a time. Lightweight and unusually strong, the Weldco hooks are made of heavy, corrosion-resistant Monel plate. The spreader bars are of steel tubing, Monel-sheathed for maximum protection against strong pickling acids and fumes, and to keep scale or rust from falling onto the coil being processed.

Many wire mills throughout the country use Weldco hairpin hooks because of their excellent service record. Why not find out how these new, improved high-strength hooks can cut your costs? A phone call or letter will bring you complete information.

THE YOUNGSTOWN WELDING & ENGINEERING COMPANY
3734 OAKWOOD AVE. . . . . YOUNGSTOWN, OHIO

POTTER, Earl R., Vice Pres.
Industrial Wire Products Corp.
Los Angeles, Cal.

PRICE, H. F., Asst., Metallurgist
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

RADZAT, G. F., Vice Pres.
Drake Steel & Supply Co.
Fresno, Cal.

RIDER, Archie P., Sales
Republic Steel Corp., Union Drawn Div.
Los Angeles, Cal.

ROBERTS, E. L.
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

ROE, Ernest P., Mgr.
Coast Wire Co.
San Francisco, Cal.

ROGERS, Peter V., Tech. Serv.
Oakite Products, Inc.
Los Angeles, Cal.

ROSE, Russel, Chf. Mechanic
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

ROY, P. P., Toolmaker
Acme Steel & Wire Co.
Los Angeles, Cal.

SARGENT, Frank, Production Mgr.
Pacific Wire Rope Co.
Los Angeles, Cal.

SAURENMANN, Wm. T., Plt. Engr.
Sealright Pacific, Ltd.
Los Angeles, Cal.

SCHROEDER, Jack F., Sales
Ludlow-Saylor Wire Co.
Los Angeles, Cal.

SHAEFFER, Paul, Foreman
Republic Steel Corp., Union Drawn Div.
Los Angeles, Cal.

SHOCKLEY, Mr., Foreman
Republic Steel Corp., Union Drawn Div.
Los Angeles, Cal.

SIEMONSMA, P. J., Asst. Treas.
Planett Mfg. Co.
Downey, Cal.

SILBERNAGEL, Philip, Owner
National Wire Products Co.
Los Angeles, Cal.

SMITH, L. O., Supt.
National Standard Co.
Los Angeles, Cal.

STEPHENS, E. G., Mgr.
Western Steel & Wire Co.
San Francisco, Cal.

STEPHENSON, S., Mgr. Wire Prods., Sales
Bethlehem Pacific Coast Steel Corp.
San Francisco, Cal.

STRACY, H. H. Mgr. Specialty Prods.
California Wire Cloth Co. Sales
Oakland, Cal.

STURGEON, D., Dies
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

SWETT, H. C., Asst. Gen. Supt.
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

TRAPP, Harry A., Master Mechanic
Anaconda Wire & Cable Co.
Orange, Cal.

TREMBLAY, R. J., Gen. Supt.
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

TURCHIN, Marvin J., Salesman
California Wire Cloth Co.
Oakland, Cal.

UNDERWOOD, E. S., Met. Engr.
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

URMAN, H., Prod Supt.
Hollister Coil Spring Co.
Los Angeles, Cal.

VOSS, Frank, Mgr.
Industrial Wire Products Corp.
San Francisco, Cal.

WALKER, James L., Salesman
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

WEGNER, G. W., Works Metallurgist
Columbia Steel Company
Torrance, Cal.

WIEGERT, Ted, Foreman
K. H. Davis Wire & Cable Corp.
Los Angeles, Cal.

WILLIAMS, Jack, Western Mgr.
Apco-Mossberg Corp.
Attleboro, Mass.

WILLIAMS, Jack, Repr.
Syncro Machine Co.
Newark, N. J.

WILLIAMS, L. C., Supt.
National Standard Co.
Akron, Ohio

WRIGHT, John D., Wire Prod. Supv., South Div.
Columbia Steel Company
Los Angeles, Cal.

YARNELL, G. E., Supt.
Republic Steel Corp., Union Drawn Div.

YOUNG, Richard F., Asst. Sales Mgr.
Bethlehem Pacific Coast Steel Corp.
Vernon, Cal.

★ ★ ★

Orville B. Ewing

ORVILLE B. EWING, manager of the New Orleans district office for The Youngstown Sheet and Tube Company, died May 11 after an extended illness. Mr. Ewing, a native of Nashville, Tenn., joined the company Feb. 15, 1927.

★ ★ ★

NEBUTT CO

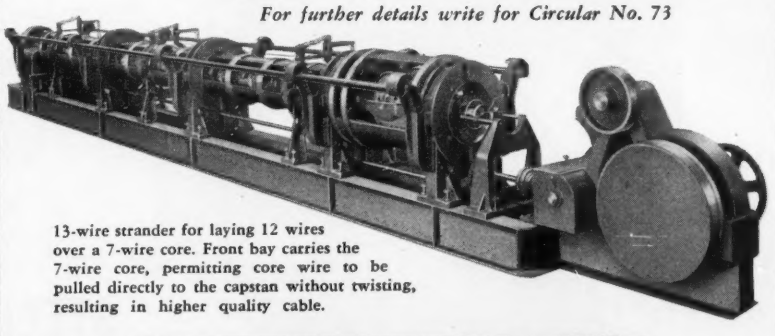
HIGH SPEED

STRANDERS

Fast, dependable producers of copper or steel cables, BUTT Stranders are designed for safe, economical operation. Mounted on a rugged base of heavy I-beams reinforced under all bearing loads, the machine is driven through V-belts, with drive from rotor to back shaft through spur gears operating in an oil bath. Carefully balanced rotors give smooth operation at high speeds. Cradles, also, are counterbalanced to reduce vibration.

The supporting rollers of Textolite operate on replaceable rings rather than directly on tube section. Automatic stopping is provided by powerful electrically operated brakes with current applied to solenoids during the stopping cycle only. No wire angles exceed 35°. In case of wire breakage or spool termination, the machine is automatically stopped. BUTT Stranders are available in Rigid, Planetary and High Speed Types, and in capacities from 7 to 41 reels.

For further details write for Circular No. 73



13-wire strander for laying 12 wires over a 7-wire core. Front bay carries the 7-wire core, permitting core wire to be pulled directly to the capstan without twisting, resulting in higher quality cable.

NEW ENGLAND BUTT COMPANY
Established 1842
304 PEARL STREET • PROVIDENCE 7, R. I., U. S. A.

JAMES DAY (MACHINERY) LTD., 90 REGENT ST., LONDON, W.1, ENGLAND

Wire Association Canadian Regional Meeting Trip to Northern Electric Company, Ltd., Plant

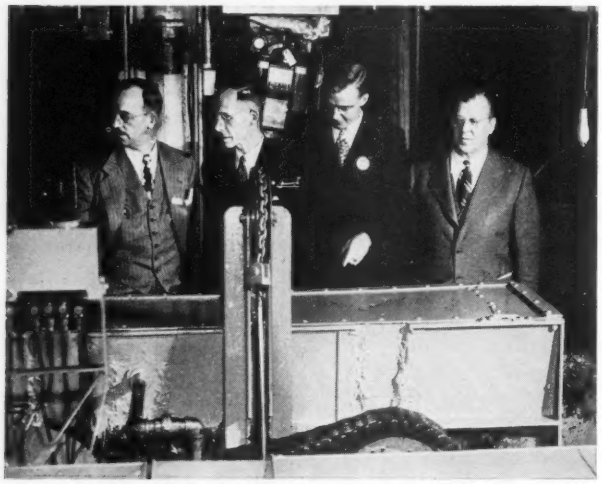
(*Continued from page 586*)

houses the tonnage products and heavy operations of Wire and Cable Manufacture, including Wire Drawing, Stranding and all other operations for the manufacture of Lead Covered Telephone and Power Cables. The plant is fully equipped for the Armouring and High Tension testing of the full range of cables for the Public Utility field.

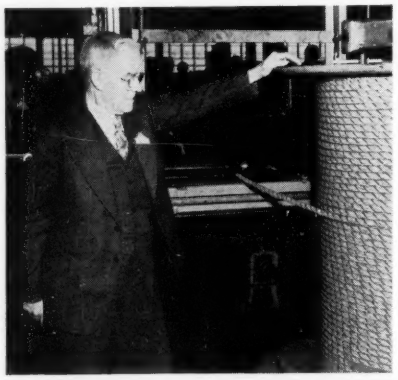
★ ★ ★

BUILT on an ideal industrial site of eighty (80) acres, it is served by two (2) railway sidings connecting to the two (2) transcontinental railways (the Canadian Pacific and the Canadian National). In addition private roadways lead from the Shipping and Receiving platform to the main Montreal-Toronto highway. Several moderately priced housing projects are located on the Montreal Island to the west of the Plant.

★ ★ ★



Shown Inspecting Machinery at the Northern Electric Co., Ltd. are L. D. Seymour, Mfg. Mgr., J. A. Roebling's Sons Co. of Trenton, N. J., and President of the Wire Association; H. B. Carnahan, Wks. Mgr. of Canada Wire & Cable Co., Ltd., Leaside, Ont.; J. G. Dickinson of the Northern Electric Co.; and F. M. Crapo, President of the Indiana Steel & Wire Co., Muncie, Ind. * * *



J. A. (Jimmy) Woodard of the Federal Wire & Cable Co., Guelph, Ont. * * *

Hydraulically Operated **TRAVERSE REELS**

FOR FLAT WIRE AND NARROW STRIP

• The self-contained, compact SECO Traverse Reel has smooth, powerful hydraulic operation — at speeds from 150 to 600 feet per minute.

PERFECT SPEED CONTROL from zero to top running speed through flow control.

ACCURATE TENSION CONTROL through pressure regulation.

Built in sizes for coils weighing up to 600 lbs., for round or flat wire. Unit shown occupies floor space 24" x 42". Modifications in design and construction to meet specific requirements.

WIRE SPOOLERS

Single and Multiple Type

Speeds Up To 4,000 feet per minute

STEEL EQUIPMENT CO.

SECO 2890 EAST 83rd STREET CLEVELAND 4, OHIO

THIS initial Plant is designed for 100% expansion to the West (foreground in aerial photo) to someday house the complete manufacturing facilities of the Wire and Cable Division of the Company.

★ ★ ★

THE balance of Northern Electric's Cable facilities are located in the Shearer Street plant in Montreal. These include Rubber and Plastics Insulated Products, Weatherproof Wires and Cables, Textile Insulated Telephone Wires and Cables, Telephone and Switchboard Cords.*

★ ★ ★

EDITOR'S NOTE:-

*** Particularly noteworthy is the scientific approach in laying out the plant for low cost material handling and the plant "housekeeping" was a housewife's dream.**

★ ★ ★

Wire Association Canadian Regional Meeting Trip to the Dominion Works Steel Company of Canada

(*Continued from page 585*)

shown in it. The group then noted the 23 ft. Patenting furnace which is used for wire patenting at this Works. This furnace is small, but carries out its purpose in doing the necessary wire patenting required by Dominion Works both in air quench and lead quench types.

★ ★ ★

THE Hot Galvanizing equipment at Dominion Works is of relatively recent construction. Due to the congested areas for approach to the department the wire is handled on reels. Lead pans performed the heat treatment operations and the wire after cleaning was galvanized in a 20 ft. electrically heated spelter pan. This furnace which was built by Canadian General Electric Company has excellent control and is governed by chamber temperatures within and without the spelter pan itself.

★ ★ ★

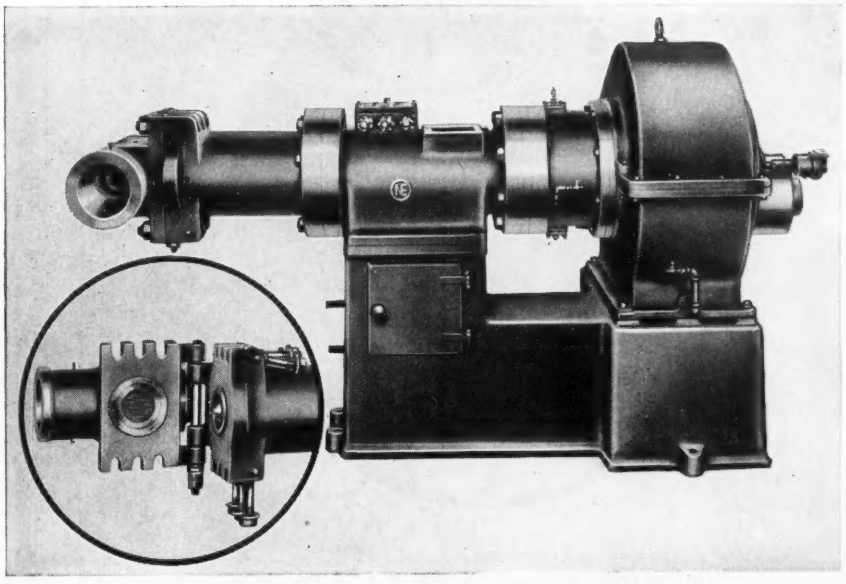
THEN followed a visit to the Fence Department where the operations of Field, Hog and Poultry fence were viewed as well as chain link fence, lawn fence and special and standard gates. The field fence looms themselves are of both ring-lock and tight-lock types.

★ ★ ★

THE party crossed the recently installed concrete shipping platform and entered the Cutting and Straightening Department, which is a portion of the Welding Wire division. Here they saw Lewis straightening machines operating at high speeds and cutting the wire in the 14" and 18" lengths for the Extruder section on the second floor. A great deal of interest was shown in the Extruder section where the hydraulic presses, with capacities of 100 and 200 tons, were extruding fairly heavy mixtures onto the wire with excellent concentricity. The extruded wire now passed through long baking ovens to the packaging section where the rod was inspect-

PLASTICS INSULATION EXTRUDER

This sturdy 4-1/2" steam heated plastic insulation wire covering machine has large capacity to permit faster operation on a wide range of wire diameters. This same machine with minor changes can be converted for rubber insulation. These machines may also be arranged for either electric contact or oil heating of the cylinder. Consult with National-Erie engineers for recommendations.



National-Erie 4-1/2" Wire Extruder designed to handle "Geon" plastic insulation.

NATIONAL-ERIE CORPORATION
ERIE, PA., U. S. A.

ed electronically, sampled for actual weld tests, and finally packed in boxes ready for shipment to the customer.

★ ★ ★

GOING once more to the first floor of this building the party saw stranding operations in progress. At the time of the visit the heavy stranders were operating on 7 strand ½" cable and the fine stranders were producing 6 x 9 ge. clothesline wire.

★ ★ ★

THE Barbed Wire, Bending and Bale Tie departments of the mill were viewed with interest. It was noted that many visitors spent a great deal of time around the four-slide hat and coat hanger machine. This machine, which is of the Nilson type, was performing an unusual operation in doing all the operations of bending and pointing coat hooks. The threading was carried out in a hand roll threader situated near the coat hook machines. Chain operations had been slowed down sufficiently that all concerned could see just how the double and single chains were made. Cotter pin machines were all running showing a complete range of sizes. In this department, also, the operators had gone to some trouble to produce exhibits showing all their products for the edification of the visitors.

★ ★ ★

THE Barbed Wire department was of the usual type producing Iowa 4 x 6" barbed wire. It was unique in speed and machine grouping.

★ ★ ★

THE Bale Tie department was last seen on the trip and this department had both the modern Downey Bale Tie machines and the old pull-carriage type which was common in the past.

★ ★ ★

EXACTLY on schedule the group was re-embussed for the trip to the Northern Electric Company where an excellent lunch was provided by the Northern Electric Company prior to the afternoon visit to that concern.

★ ★ ★

All Metal

WIRE SPOOLS

Light weight, all-steel, lithographed.
5", 6½", and 10½" diameter ends.
Ends and traverses may be shipped unassembled.

We also produce spools for fine and magnet wire.

J. L. CLARK MANUFACTURING CO.
600 23rd AVENUE • ROCKFORD, ILLINOIS

SEND IN
YOUR ORDER NOW
for the
1949 WIRE BUYERS
GUIDE

Exhibit at Montreal

AN exhibit creating much interest during the Canadian Regional Meeting in Montreal in April was the model Lewis Travel-Cut Wire Straigthening and Cutting Machine, manufactured by the **Lewis Machine Company** of Cleveland, Ohio. This was a working model of a standard ½" machine and drew a lot of attention. The exhibit was arranged by **M. Samuel** of the **Empire Engineering Company**, 11 Wellington Street, East, Toronto, Ontario, the Canadian Representative of the Lewis Machine Company.

★ ★ ★

Electrical Controls for Wire Mill Machinery

(*Continued from page 598*)

current motor can be a two or three to one motor by field range. This gives a wide range of speed and may eliminate some of the speed changes.

★ ★ ★

EACH mill must decide which type to use as determined by the economics of the job. Some mills may have a widely diversified schedule and the ability of a direct current motor to supply additional speed increments, over and above those given by gear changes, may make this type of drive the most desirable. On the other hand, if it were necessary to install a generator to obtain the direct current, then this investment must be taken into consideration in making the final decision.

★ ★ ★

SINCE many rod machines are used with spoolers of various types, mention will be made of several types of motors and control, which are used on these drives.

★ ★ ★

A SUCCESSFUL spooler drive must accelerate the spool at the same rate as the rod machine, and must synchronize with it while running. On stopping, it is important that the spool stop in the same time or less than the rod machine to avoid breaking the wire.

★ ★ ★

A COMPLETE paper could be written on the subject of spooler drives and control alone. The usual practice has been to use a wound rotor motor, when an alternating current drive is used, and to use a controller with the wound rotor motor to give the drive "inherent winder" characteristics.

★ ★ ★

THE term "inherent winder" characteristics requires some explanation. It really consists of a drive which will have inherently, a speed torque curve that will give the right amount of torque to a spooler as it gradually fills with wire. When the spool is empty it must run at a high speed, and as it gradually fills, the speed must slow down. Actually the performance required is very close to that of a constant horsepower drive, however, the variation in WR^2 of the drive at various speeds introduces a large number of problems, which must be solved to obtain the required performance.

★ ★ ★

A WOUND rotor motor used in this application is geared at a speed ratio below its synchronous speed. The controller is designed with selector switches to allow various speed torque curves to be selected for running. Such an arrangement also is followed for accelerating the motor, keeping it in step with the rod machines, and for plugging to a stop.

★ ★ ★

SHUNT wound direct current motors can be used in this same arrangement and if the main motor is of the direct current type then the spooler is usually also.

★ ★ ★

For Improved Drawing and Longer Die Life

Copper-coat **WIRE, ROD and TUBING** *with*

Cuprodine®

"Cuprodine", in a simple chemical process without current, deposits an adherent layer of copper on both mild and stainless steels. This layer acts as an effective lubricant—reduces wear and scratching of dies; prolongs die life; minimizes scratching on wire, rod and tubing; and increases the number of draws per die.

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING
Granodine *
Duridine *
Alodine *
Lithoform *
Thermoil-Granodine *

RUST REMOVING AND PREVENTING
Deoxidine *
Peroline *

PICKLING ACID INHIBITORS
Rodine * ®

"Cuprotek"® passivates Cuprodized and other cuprous surfaces, and acts as a paint bond, or a good temporary preventive of corrosion.

Write or call Ambler 0486, for further information on both "Cuprodine" and "Cuprotek".

Pioneering Research and Development Since 1914

AMERICAN CHEMICAL PAINT COMPANY

AMBLER, PA.

Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

ANOTHER form of drive which is used with either type of motor is an eddy current clutch. The success of these has varied somewhat on the size of spools to be handled and the size of wire. It appears that these have had the best results on the larger spools.

★ ★ ★

SOME of these spooler drives can be operated without any rider or dancer arm. As speeds go up, the best operation will be obtained by using a dancer arm ahead of the spool. This arm will give a slight wire storage between the rod machine and the spooler. Whether or not this dancer arm is actually used to control the motor, will depend on the speed, and the size of wire being run.

★ ★ ★

ALL of the drives on these spoolers have been used with some form of additional brakes to stop the spool with the machine.

★ ★ ★

THE foregoing statements may seem rather general on spoolers, but in a discussion like this, they must be general because so much depends upon the product being wound, the size of wires, the size of spools, the speeds, and everything connected with the drive. Each drive must be looked at individually, since a general statement of what type is best for a particular drive cannot be made.

★ ★ ★

SEVERAL jobs have been installed, in plants where direct current was not available, with a straight Ward-Leonard system. A direct current motor, driven by its own generator was used on the rod machine, and a separate generator supplied the spooler. The drives were synchronized by having the spooler generator excited from a tachometer on the rod machine.

★ ★ ★

A TENSION regulator, using current as a reference was used on the field of the spooler motor. This gave a constant horsepower characteristic to the spooler motor. This setup gave excellent starting and running characteristics. On stopping it was necessary to use an auxiliary brake to obtain a stop with two or three seconds. The drive could be stopped without breaking wire in from six to eight seconds from practically any speed.

★ ★ ★

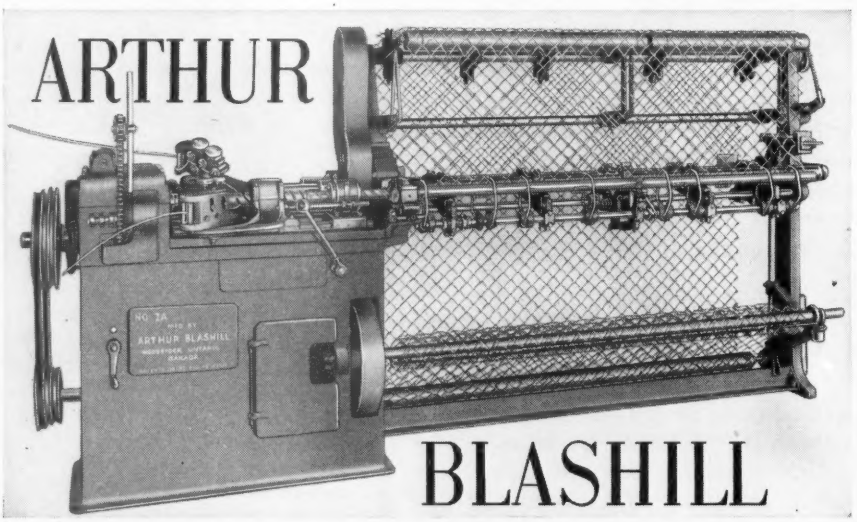
THE mill operators chose to use the control so arranged that they obtained the shortest stop possible. By way of explanation, we might say that the spooler motor was of ample size to accelerate and run in from six to eight seconds, and therefore had sufficient torque to stop the drive in the same time.

★ ★ ★

THERE was too much WR^2 involved for this same motor to stop the spool by itself in three seconds. A motor three times the one used, with a corresponding increased generator size, would have been necessary to supply all the

MAXIMUM PRODUCTION
in
CHAIN-LINK FENCING

Fastest Spiral Forming Speed —and two spirals at once.
Shortest stop for Cut-off and Advance, under 3/4 second.
Highest percentage of time on actual weaving.
Fence rolled near operator, saving time and energy.
Low Power 3 h.p. (or 4 h.p. for 6 ga.), Ball and Roller Bearings.
Smallest floor space, 3 ft. wide only.
Lowest maintenance, very finest construction.
Instant clutches of proven type, and
Accurate stops to exact cutting position.



Edges of fence either Knuckled or Barbed.
Fence any width 24" to 84", or 144" (7' or 12' machines).
Meshes 1 1/4" up to 4" according to tool equipment.
Gauges of wire No. 6 to No. 14.
Up to 150 square yards per hour, 2" mesh, on uniform wire.
Fully automatic—one girl now operates two machines.

WOODSTOCK, ONTARIO, CANADA
Formerly at Birmingham, England.

stopping torque, and this was not considered economically sound.

★ ★ ★

UNQUESTIONABLY the complete variable voltage system offers the smoothest operating characteristics, and the most easily adjustable of any of the systems mentioned of a combination of a rod machine and spooler. However, the initial investment is considerably higher than the other systems, and this economic factor cannot be overlooked in judging the merits of any particular installation.

★ ★ ★

INTERMEDIATE machines of the slip type which are used for nonferrous products are usually powered with motors between 50 and 100 horsepower. A few of these machines have been installed with separate electric drives for spoolers. The majority of them continue to have the spooler driven from the main machine by means of a hydraulic or friction unit.

★ ★ ★

WHEN only alternating current power is available a wound rotor motor with between four and five points of acceleration offers the best drive. This number of acceleration points will give smooth acceleration to the machine.

★ ★ ★

THE larger rod machines which we previously discussed, when driven by alternating current motors, are seldom plugged. They are allowed to stop by friction. The intermediate machines however, due to the smaller size motors and smaller current surges, can be plugged if desired. If a friction brake is used on the spool, then the machine definitely should have plugging to insure that the spool and the main machine will stop smoothly.

★ ★ ★

ONE definite improvement has been made in the controlling of the plugging on these machines. The usual custom has been to use a zero speed switch to drop out the plugging contactor when the machine approached rest. This switch was mounted on the motor, and in many cases projected beyond the machine and was damaged by trucks or shop traffic in general. A voltage relay operating on the secondary voltage of the wound rotor motor has replaced the zero speed switch. The voltage relay itself is not new, as various types of current, frequency and voltage relays have been used in this manner for at least fifteen years to the author's knowledge and probably before that. However, practically all of the relays have been rather fragile, erratic or not "fail-safe". The present voltage relay mentioned together with what is essentially a "fail-safe" circuit gives very successful operation when used in this manner.

★ ★ ★

IF direct current power is available, then a direct current motor, with a speed range by field of from two or three to one, will be

used on intermediate machines. The controller will have four to five accelerating points depending on the horsepower. Stopping will be done by dynamic breaking and again, if the spooler is equipped with a brake, then a graduated form of dynamic breaking will be used to bring the spooler and the machine to a stop together.

★ ★ ★

VARIABLE voltage drives have been used for driving this type of machine. The main advantage is the range of speed adjustment which is possible with this type of drive. If only one of this type of machine were being installed at a plant, where only alternating current was available, then this system could be justified with its higher initial cost. If a group of these were to be installed for the usual run of products, a single direct current generator for the group would probably be the most economical and logical arrangement.

★ ★ ★

THE variable voltage drive in this case has little to offer over blocks driven by direct current motors operated from a bus.

★ ★ ★

FINE wire machines, which are used in the non-ferrous, and, to some extent, in the ferrous field, can be considered very much in the same class as the intermediate machines, as far as drives and controls. Usually, quite a group of these are installed in one location and the usual drive is a direct current motor. The controller will have three to four steps of acceleration, and the motors will have a field range of from two to one, to four to one. Otherwise, practically all the comments made about the intermediate machines will apply to this type also. On this machine the horsepower required is from 7½ to 15.

★ ★ ★

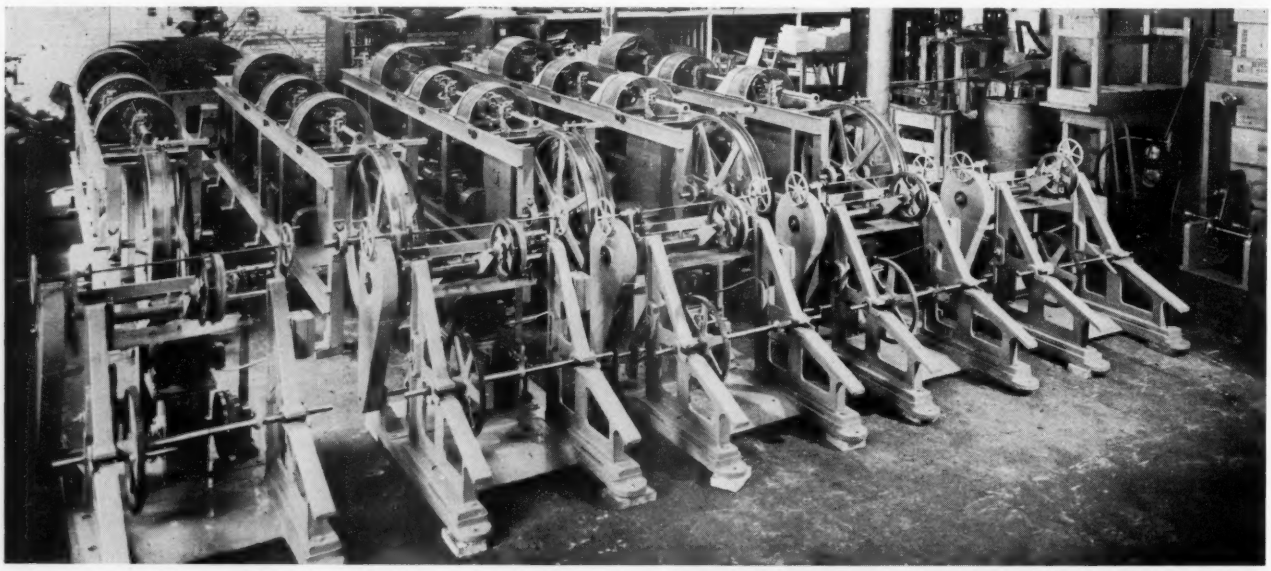
WHEN alternating current is used on this machine, a wound rotor motor is the logical drive. The elimination of the zero speed switch is a very marked advantage here, because the machines are not large, and the mounting of the switch may mean that considerable floor space will be lost.

★ ★ ★

IN the ferrous field, single motor multi-capstan blocks have had very little change in their controllers for several years. The majority of blocks are driven by either three, or four to one field range direct current motors. The controllers supplied to them are similar to those used for bull blocks. A total of six acceleration points are usually used and, either one, or two of these points may be armature shunt.

★ ★ ★

A GOOD many of the blocks are push button operated, but there is an increase in the use of a master switch with the controller to obtain better operation during threading. A master switch, or some method to allow the oper-



GROUP OF HORIZONTAL MACHINES FOR PAPER AND COTTON APPLICATION

Ball-bearing mounted throughout
Welded steel frames

(Send for Bulletins 77-B-7, 80-C, and 81)

We also build a complete line
of
Wire Enameling Machines

EST 1883 AIMCO INC. 1918
"American"
AIM INSULATING MACHINERY COMPANY
517 West Huntingdon Street
Philadelphia 33, Pa., U.S.A.

ator to select different resistor points while threading, is definitely an improvement, and it should be incorporated in new controls.

★ ★ ★

WHERE alternating current power only is available, wound rotor motors are used. This gives a satisfactory drive, if a speed range is not required. The number of accelerators will, of course, vary with the horsepower, but the number used will be approximately the same as we have previously mentioned for equivalent horsepowers on rod, and intermediate machines for non-ferrous products.

★ ★ ★

ONE installation of controllers recently was made on six machines, which had previously had manual control. They were equipped with modern magnetic controllers which applied direct current to motors for braking. Direct current was available from a 230 volt bus. At the present writing the operators are obtaining very good results.

★ ★ ★

TO digress for a moment, the author should have recommended direct current braking on several other drives mentioned in this paper. However, so few plants have alternating current driven machines, and still have an ample supply of direct current, that it was not included. If it is necessary to supply the direct current generation equipment to obtain braking, the initial cost is considerably over that of the more conventional plugging control.

★ ★ ★

THE multi-capstan, multi-motor wire drawing machine is a major factor widely used in the ferrous field. It is possible that it will become a large factor in the non-ferrous field. Each capstan is driven by a direct current motor having a speed range of two or three to one, and heavily compounded. The final capstan has its field adjusted by a manual rheostat, and each of the preceding motors has its field controlled by a dancer arm operating a rheostat. The motor armatures, and there may be from three to eight, are handled as a unit from one controller.

★ ★ ★

UP to eight years ago, all machines of this type were powered from a direct current bus. About that time some mills required extreme speed ranges and a variable voltage system was developed which gave excellent results.

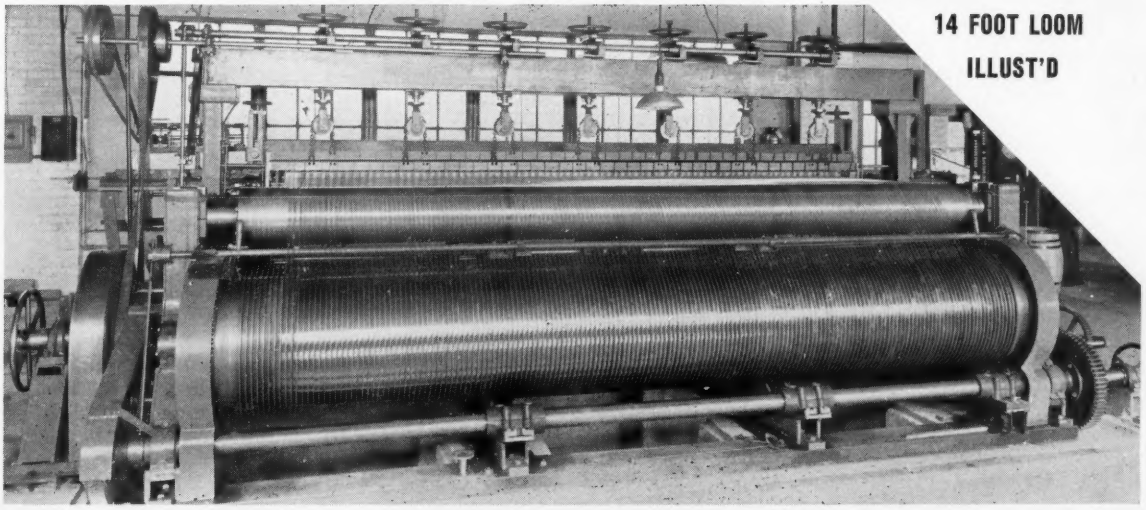
★ ★ ★

IN the last eight years, both systems of control have been improved. If direct current power is available in a plant installing machines of this type at this time, the question is largely economic as to which system is used, provided the products to be run do not require a wide speed range. A wide speed range, or lack of direct current power dictates the use of the variable voltage system.

★ ★ ★

ON the constant potential type, the controller will supply from six to seven steps of acceleration

WIRE WEAVING LOOMS FOR INDUSTRIAL WIRECLOTH — FLY SHUTTLE LOOMS



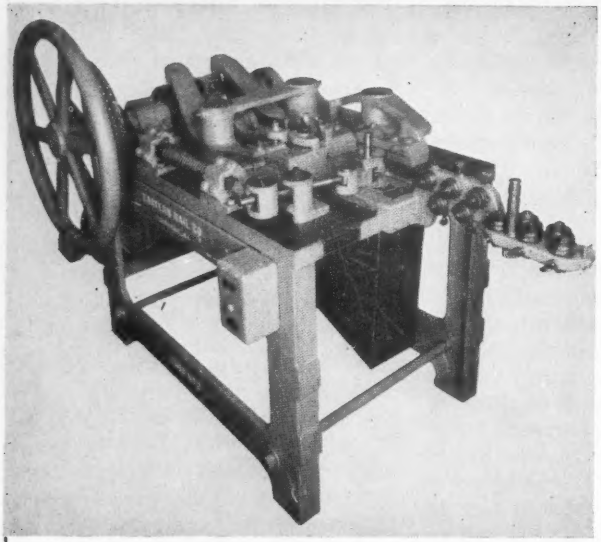
14 FOOT LOOM ILLUST'D

Offers many important features
All steel welded construction for rigidity and long satisfactory service
Precision in workmanship, operation and production
Built in st'd models 3', 4' 6'-8'-10', 14', 20' or to your special specifications

Write your requirements to

BRUCKNER-MITCHELL, INC. 420 W-45th St., New York 19, N. Y.

PROMPT DELIVERIES ON
"ENCO"
WIRE NAIL MACHINES



Easy To Set Up And Operate.

Furnished belt drive or with motor including V belts, starter, etc.

No. 2 size will cut nails up to 3" long No. 9 gauge and the No. 1 size up to 1¾" long No. 13 gauge.

Write for prices, stating size and number of machines wanted.

EASTERN NAIL COMPANY
55 ALEPPO STREET • PROVIDENCE 9, R. I.

NORBIDE Abrasive: Effective, Economical

This abrasive—second only to the diamond in hardness and 150 times less expensive—does an efficient job of cutting and semi-finishing cemented carbide wire drawing dies.

NORTON CO. — Worcester 6, Mass.

with field forcing at the start of the cycle. On stopping, the motors are dynamically braked with their armatures in parallel by two steps of dynamic braking and field forcing on the motors. When a variable voltage control is used, the accelerating contactors are in the field of the generator, and about the same number of steps are used. On stopping, regenerative braking is used down to a low voltage, and then dynamic braking, together with field forcing, is used for a final stop.

★ ★ ★

A CONSIDERABLE amount of development work is under way on control for this type of machine at this time, because it appears that this general type will be used, for higher speeds than it has been in the past. There has been a continual raising of the top speeds at which wire can be drawn, and the higher speeds will require more exacting control.

★ ★ ★

IN closing the author regrets that he has not had the time to give more information about certain points mentioned. Several of the various types of drives described briefly, could be made the subject for a paper in itself.

★ ★ ★

THE author has attempted to cover the various classes of machines in wide use, in both the non-ferrous, and, in the ferrous fields, and give a general description of what is being used, and being installed in various plants at this time.

★ ★ ★

THE wire drawing industry is growing tremendously, and we know that operating speeds and production will be increased year by year. Increasing speeds in any type of production is going to require very close cooperation between all parties involved, the operating men, machinery builders, the electrical equipment builders and the metallurgists. We fully expect that this industry will continue to progress just as it has in the past.

★ ★ ★

Handling Wire and Wire Products with Industrial Trucks

(*Continued from page 602*)

gondola cars. Other coils go through additional drawing operations or are coated or pickled. During these processes ram trucks are used to handle much of the wire and rams up to 120" in length are employed. Some of the company's wire is sent to one of their own plants down in Illinois where barbed wire, nails, spikes and other items are made. At this plant 2-ton articulated fork trucks are successfully used to cut down aisle space on the loading dock and to take pallet loads of outgoing material into the boxcar. At the present time shipments are not made to customers on pallets because most customers are not set up to unload units of 2-ton. However, the 3 articulated fork trucks being used in the shipping department of this large plant is saving them about $1,100.00 per month due to the trucks' ability to take pallet loads right into the ends of the car where they can be successfully unloaded rather than leaving the pallet at the loading dock necessitating hand methods in transporting from there to the end of the car.

★ ★ ★

ONE of our Ohio companies receives 11-gauge wire in coils which arrive in boxcars or over-the-road trucks from two suppliers. This company which makes wire tire-beading has a 3000 lb. capacity fork truck equipped with a ram to unload these incoming shipments. The truck handles 6 or 7 coils at a time and unloads a boxcar in 45 minutes. Before the truck was used boxcars and trucks were unloaded with a special type of hand truck that could only handle 2 coils at a time. Four or five men were assigned to unload a boxcar and it took them 4 to 5 hours. Production of the plant had to be geared to the rate at which incoming material could be handled and it has been found that the installation of a ram truck has allowed production to be just about doubled. In other words manual handling methods if used today

If it's twisted folded pressed crushed shaped braided woven paper

TWITCHELL makes it

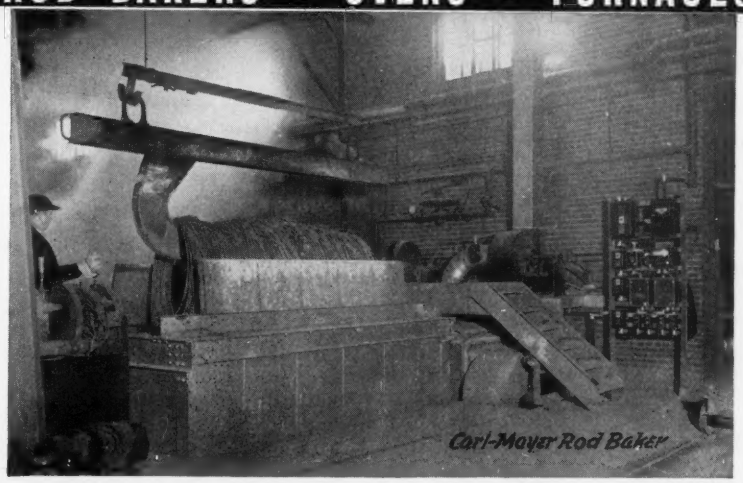
treated braiding and wrapping yarns wound single or multiple ends parallel for new high-speed Abbosealed process or standard braiding equipment.

treated wire-rope cores

waxed cable-fillers for 2- and 3-wire non-metallic sheathed cable and shipboard cable, etc.

E. W. TWITCHELL INC.
Third & Somerset Streets
Philadelphia 33, Pa.

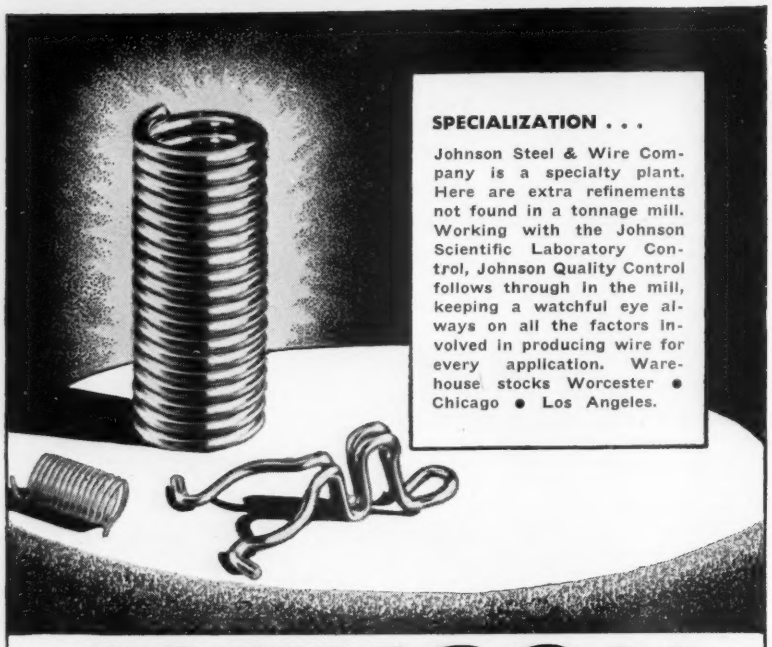
MORE PRODUCTION *with* CARL-MAYER HI-SPEED
ROD BAKERS - OVENS - FURNACES



Patented
TYPICAL HI-SPEED ROD BAKER — DIRECT OR INDIRECT HEAT — ANY FUEL
WRITE for BULLETIN No. 241
Growing interest in our type of equipment is evidenced by Carl-Mayer installations for such plants as:—

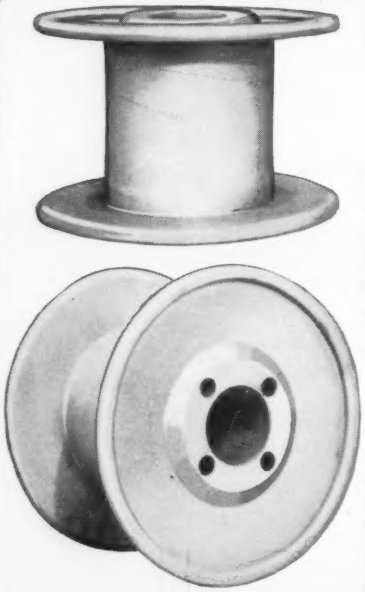
American Steel & Wire Co.
Atlantic Wire Co.
Atlas Steel Co.
Atlas Tack Corp.
California Wire Cloth Corp.
Eaton Mfg. Co.
Frost Steel & Wire Co. Ltd.
Hollup Corp.
Johnson & Nephew Ltd.
Jones & Laughlin Steel Corp.
Pittsburgh Tool Steel Wire Co.
Republic Steel Corp.
Steel Co. of Canada
Wickwire Spencer Steel Div.
Page Steel & Wire Co.

THE CARL-MAYER CORPORATION
3030 EUCLID AVENUE
CLEVELAND, OHIO


SPECIALIZATION . . .
Johnson Steel & Wire Company is a specialty plant. Here are extra refinements not found in a tonnage mill. Working with the Johnson Scientific Laboratory Control, Johnson Quality Control follows through in the mill, keeping a watchful eye always on all the factors involved in producing wire for every application. Warehouse stocks Worcester • Chicago • Los Angeles.

JOHNSON
STEEL AND WIRE COMPANY, INC.
WORCESTER 1, MASS.
NEW YORK PHILADELPHIA CLEVELAND DETROIT AKRON CHICAGO
ATLANTA HOUSTON TULSA LOS ANGELES TORONTO

FOR HIGHEST SPEEDS
APCO MOSSBERG
PRECISION
STEEL REELS



The reels that are engineered to the job... designed and built by the company that originated the steel reel idea . . . are the reels you should be using in your plant. Every year, more and more Apco Mossberg Steel Reels are bought by quality-minded buyers throughout the wire industry.

FREE
ENGINEERING SERVICE
Without obligation to you, Apco Mossberg engineers will be glad to study your reel problem, and supply complete suggestions, drawings, blue prints. Write for information today. *Canadian Representatives:* Hugh Williams & Company, 47 Colborne St., Toronto, Ontario. *Pacific Coast Rep.,* Jack P. Williams, Jr., Matson Building, 215 Market St., San Francisco 5, Calif.

REELS . . . SPOOLS . . . BOBBINS

APCO MOSSBERG COMPANY
(THE ORIGINAL FRANK MOSSBERG CO.)
21 LAMB ST., . . . ATTLEBORO, MASS.

would not permit the plant to operate at its present production rate. This same ram truck after placing the coils in a dry, heated room later supplies the drawing stands by bringing coils from the room to them.

★ ★ ★

IN an Indiana steel and wire plant ram trucks have been used since the 20's. Incoming wire is in gondola cars or in boxcars. Wire that comes from gondola cars is handled by crane while the boxcar unloading job is done with a ram to transport the coils to and from the pickling tanks and to the various operating points. This plant was set up with industrial trucks as much a part of the productive scheme as the drawing stands and no other method of handling has ever been employed and therefore no comparative cost figures are available.

★ ★ ★

ONE of the largest truck users in the country recently installed the largest enameled magnet wire plant in the world. The plant was engineered around the use of ram trucks to transport coils from one process to another. Incoming stock of 7/16" diameter rod is drawn down to various sizes, the minimum being .004". Various types of coatings are given to the wire depending on the use. The 7/16" diameter wire in coils comes in boxcars and is unloaded by a ram truck. Sometimes these coils are double-decked. The trucks take the raw stock to storage and from storage it is handled to the drawing mills by overhead cranes. After the drawing operations the wire is wound on metal spools or reels that are 30" to 36" in diameter and weigh up to 2000 lbs. Small ram trucks are used to pick up single reels or two reels at a time taking them to the annealing furnaces or to other operations. Many of these small reels are laid on their sides on pallets and handled with similar trucks equipped with forks.

★ ★ ★

TO get at your own local materials handling problems, there is no short-cut substitute for com-

STANNOUS SULPHATE

for IMPROVED LIQUOR FINISHING of STEEL WIRE!

Stannous Sulphate, used for either straw color or white liquor finishing, provides these outstanding advantages:

1. A superior, smoother coating
2. Positive control — making it possible to produce uniform coatings day in and day out
3. Easier to use — fewer operations involved
4. Economy — requires use of less copper sulphate, less acid
5. More Economy — reduces tin losses by eliminating high tin sludging.

Write for information on how to use Stannous Sulphate to best advantage in your liquor finishing.

METAL & THERMIT CORPORATION
120 Broadway • New York 5, N. Y.

plete analysis. There are two ways to make such analyses, one by assigning someone on your staff who is qualified and has the time or have a qualified group do it for you. Either course will save money in the long run. What must be determined is (1) what is being done, (2) why is it being done, (3) where is it being done, (4) how is it being done. You or they will find out (1) where it should be done, (2) how it should be done, (3) by what it should be done.

★ ★ ★

Bethlehem Sets Record at Sparrows Point

THE rod and wire mill of **Bethlehem Steel Company** at Sparrows Point, Md., is setting high

Veteran Worker at Bethlehem Steel Company's Sparrows Point Plant looking over powdered white soap.

production marks with a top of 33,140 tons of wire being drawn in the space of one month. The products vary in diameter from .035 in. to .625 in.

★ ★ ★

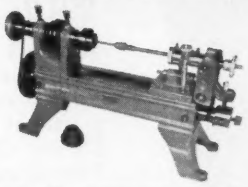
IN the photo, a veteran wire drawer at the mill is looking over powdered white soap used as a lubricant on the wire (left), which passes through a series of five dies on the table in front of the workman. The five drafts reduce the high carbon spring wire from 5 to 12½ gauge.

★ ★ ★

THE plant made wire history in that the first bethanizing, or zinc-coating by Bethlehem's electrolytic process, was done there in 1933.

★ ★ ★

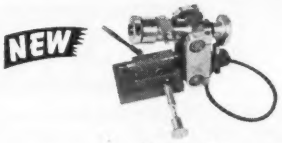
NEW ROOS
DIE ROOM EQUIPMENT
SEMI-AUTOMATIC POLISHER



MODEL OT - PATENT REGISTERED AND APPLIED FOR

Note these outstanding features for greater accuracy in polishing dies and for prolonged machine life!
(a) Quick opening spindle
(b) Pressure adjustor
(c) New cam assembly
(d) New style leather belt

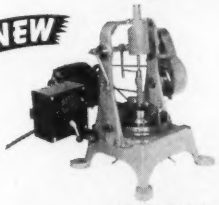
NEW STYLE TAILSTOCK
To Fit Other Model
ROOS Polisher Model OT



MODEL OT

You can quickly and easily replace the tailstock on your old Roos Semi-Automatic Polisher with the New Model OT-Tailstock. Quotation on this new Tailstock furnished on request.

ROOS
AUTOMATIC DIE SHAPING MACHINE



MODEL DS-3A

Offers you three improved features: a die rotating attachment; a time switch; and a reversing switch—which provide these advantages:
1. Die rotating attachment and time switch eliminate the formerly necessary constant attention by operator. Rotation of die is automatic, and machine shuts off automatically at end of time cycle.
2. Reversing switch permits rotation of the die in either direction.

Write today for full information!

ROOS TOOL & MFG. COMPANY
17-19 Grove Street
Montclair, New Jersey

Cut Cost of Expensive DIES with PERMAG

PERMAG Wire Drawing Compounds have met the test of efficiency and economy in several prominent wire mills. Additional life to dies is important and helps to reduce costs as well as speed up production. Clean bright appearance of the wire in process is also a feature of PERMAG lubricants.

If you have a wire lubricating problem let our Technical Specialists help you.

Write us • No obligation for interviews.

Magnuson Products Corporation

Mfrs. of Specialized Cleaning Compounds for Industry

50 COURT ST. BROOKLYN 2, N. Y.

In Canada: Canadian Permag Products Ltd., Montreal

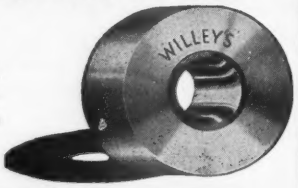
PERMAG

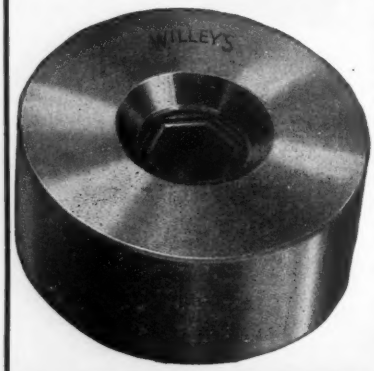
More than 340 Cleaning Compounds are now made under the PERMAG trade name to meet the growing demands of industry.

WILLEY'S DIES LAST MUCH LONGER

SPECIFY WILLEY'S SIZING, EXTRUSION and WIRE DRAWING DIES

Pioneers in the manufacture of wire forming dies, Willey's is in position to make dies to your specifications that give superior performance, cut production costs and hold tolerances for long runs.





There are standard one-piece round dies, available from stock in many sizes — as well as four classifications from blank and rough cored nibs to finished dies, ready to use.

WRITE FOR NEW CATALOG 449

Full information on all sizes and classifications, as well as hundreds of Willey's Tools for other uses.

WILLEY'S CARBIDE TOOL CO.

SOLE MAKERS OF WILLEY'S METAL

1342 W. Vernor Highway Detroit 1, Michigan

Wire Drawing of Some Non-Ferrous Metals

(*Continued from page 592*)

oil and a pigment filler (calcium carbonate) are successful in such draws.

★ ★ ★

THE oils used in an application of this kind may vary in viscosity from S.S.U. 2500 @ 100°F. to as heavy as a grease consistency, and are usually compounded with either fatty oils, fatty acids, soaps, sulphonates, or other emulsifying agents. The latter appear to aid in drawing and have an advantage in cleaning since any oily residue on drawn rod or wire can be removed with either hot water or one of the mild alkaline type aqueous cleaning solutions. This eliminates the costly and sometimes dangerous need for inflammable or toxic solvents for cleaning.

★ ★ ★

THE concentration of compounding used in these heavy oils and semi-fluid greases is usually from 10-25%. Some operators report that the softer pure metal and low alloys seem to require more fatty oil compounding than the hard, high tensile alloys. This observation may be related to (1) greater tendency of soft metals to pick up on dies and (2) the chemical surface activity effects of free fatty acids contained in the lubricant to provide better boundary lubrication and thus to prevent this metal pickup.

★ ★ ★

IN some cases a dry powdered soda soap is alternated with a drawing oil or grease in that the grease box ahead of the first die may contain the grease, the second box, or the next two, containing dry soap, the next grease again, etc., for the successive draws. If a grease is used instead of an oil, it should be of sufficiently soft and tenacious consistency so as to be drawn into the die. If too hard and smooth, the grease will "channel" and prove useless. Some oils and greases are compounded with chemically active

materials (sulfur, chlorine compounds, etc.). These appear to help in severe reductions but are always liable to cause dark stains if too active at the die temperatures. Drawing speeds in operations as described above are on the order of 200-500 feet/minute.

★ ★ ★

FOR further reduction down to about 0.064-0.077 diameter at drawing speeds of 1,500-2,500 feet per minute, lubrication is provided by somewhat lighter viscosity oils compounded with soaps and fatty oils and circulated over the dies. Bulk oil temperature is preferably held at around 100-150°F. unless, for metallurgical reasons in drawing alloy wire, it may be desired to use a higher bulk temperature.

★ ★ ★

IT may be necessary to use water tube coolers, or even refrigerant coils in the oil tank to hold down to the desired temperature, dependent upon oil volume, rate of circulation, oil viscosity, etc.

★ ★ ★

WHERE oil is thus circulated at a high bulk temperature and subjected to the contaminating effect of the aluminum fines, it may thicken up in viscosity. Dependent upon the constituents in the oil, this is probably due to formation of aluminum soaps from free fatty acids present. The use of a lighter viscosity diluent (up to 30% dilution) has in some cases helped. Ordinarily, as low a viscosity as possible is desirable to facilitate oil circulation and cooling in a circulating system.

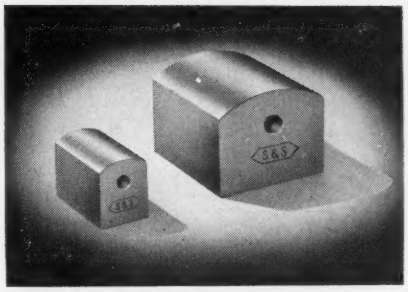
★ ★ ★

THE use of a neat soluble oil having a viscosity of S.S.U. 350@100°F. and containing a water emulsifiable compound has been found satisfactory for drawing cable wire at 1,000 feet per minute. An added advantage of this product is ease of cleaning with water since the oil is readily dispersed in water.

★ ★ ★

THUS far no mention has been made here of the use of emul-

Sjogren SWAGING HAMMERS



SJOGREN Swaging Hammers represent another proven product in the S&S line! Shock resisting, high-grade steel is used to assure you of continuous production. Standard sizes of S & S hammers are available from stock; special sizes are made to order on your specifications. A rugged S&S Swaging Hammer is your guarantee of service.

Used by Wire Men Who Want the Best!

SJOGREN TOOL AND MACHINE CO., INC.

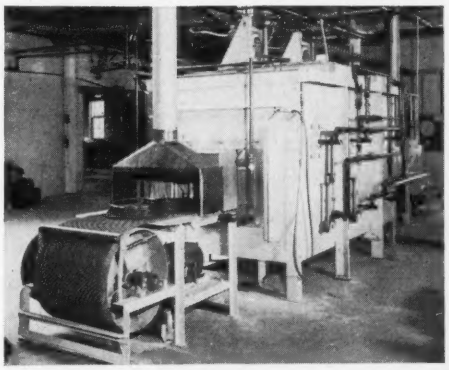
WIRE PULLERS • WEDGE GRIPS • JAWS FOR ALL MAKES OF PULLERS AND TESTING MACHINES • CAGE ROLLERS • SWAGING HAMMERS • POINTING DIES • WIRE SPOOLERS

14 SWORD STREET
AUBURN
MASSACHUSETTS

Represented in Canada by THE LARSON CO., 98 Wellington St., West, Toronto, Ont.

ROCKWELL Belt Conveyor FURNACES

For Continuous, Uniform Annealing, Bright Annealing or Hardening Rod or Wire in Coils or on Spools.



This is one of the many Rockwell batch and continuous belt or strand types—fuel fired or electric—for any gauge or quantity of wire of any metal.

Scale-free annealing of non-ferrous coiled rod in an open gas-fired, belt conveyor furnace. Also used for bright annealing certain metals.

Bulletin 418 describes various types of Rockwell furnaces for wire heating. Write for a copy.

ROCKWELL ALSO BUILDS

Coil winding machines, reels and spools; pickling, brushing, cleaning, washing, finishing, drying and handling equipment; ovens and dryers; special fabrications; non-ferrous rod mills.

ROCKWELL SINCE 1888 BUILT

FURNACES • OVENS • SPECIAL MACHINERY

W. S. ROCKWELL COMPANY

242 ELIOT STREET • FAIRFIELD, CONN.

In Canada: Francis Hankin & Co., Ltd. Montreal & Toronto

EXTRUDERS

THAT OFFER MORE

WIRE COVERING CAPACITY

MPM offers six-zone control of electrically heated cylinders with nine-eleven or fifteen separate cooling zones for removal of frictional heat or for fast cooling. Higher temperatures—higher screw speeds—higher production—per machine.

FLEXIBILITY - Operating Economy

These MODERN machines are furnished electrically heated but can be heated or cooled by steam, oil, water, etc. Interchangeable heads and dies to produce covered wire, tubing, rods, strips, wide sheeting are also available along with conveyors, granulators, dryers, etc.

FAST DIE OR SCREEN CHANGES

Modern engineering and specialization has resulted in the installation of these machines with 18 of a possible 20 leading material suppliers during the past two years. More complete cooperation with foreign customers too has made MPM the largest exporters of Extruding equipment during the same period.

modern plastic machinery corp. mpm

GREATER *Flexibility* = MORE PROFITS!

SEND FOR BROCHURE

15 UNION ST., LODI, N. J.

CABLE ADDRESS MODPLASEX

FOR SALE

Magnet Wire Mill Equipment

2 Bull Blocks
1 Take Up Rack
3 Intermediate Wire Drawing Machines
3 Intermediate Take Up Spooling Racks
3 Eight head fine wire drawing machines
1 Four tank gas fired annealing oven
1 Generator AC to DC
1 Lot each Metal Spools, 24", 18", 12", 6"
Electric Motors: 1, 25 HP; 3, 10 HP; 1, 15 HP; 1, 30 HP new.
Complete inventory diamond and carboloy dies A1 condition sufficient to operate this equipment.
1 Fireproof die safe
Laboratory testing equipment for wire drawing and other miscellaneous equipment.

magnet wire division

NEON PRODUCTS, INC., LIMA, OHIO

sions or other aqueous solutions for drawing aluminum wire. Though not generally practiced, this is possible as demonstrated by experienced operators' results on a commercial scale.

★ ★ ★

A TYPICAL installation is in drawing aluminum screen wire from 0.064" down to 0.012" through 9 carbide and 5 diamond finishing dies at 3,400 feet per minute. For an operation of this kind it is possible to use either neat compounded light viscosity mineral oils or a water emulsion circulated through the machine and over the dies. If oil is used it should be about S.S.U. 100-150 @ 100°F. and compounded with from 5-15% of a suitable fatty oil. If an emulsifiable oil is used, the neat oil should be applied to the entering size wire ahead of the first die, either by swab, spray, or dip application. An emulsion consisting of one part neat soluble oil and 15 to 20 parts water is circulated in the machine.

★ ★ ★

TYPICAL commercial soluble oils or lubricants used in an emulsion form (3-5% concentration) for drawing aluminum wire are composed of soaps which may be fatty acid or sulphonate type, fatty oils, mineral oils, and chemically active compounds, principally sulfur and phosphorus additives. The latter, unless properly used, however, may cause some staining of the drawn wire.

★ ★ ★

EMULSIONS may be formed, with suitable oils, in water up to 700 p.p.m. hardness or even higher. Tests made of one emulsion at 160°F. bulk temperature showed only 1% oil layer separation on top of the emulsion after 72 hours standing.

★ ★ ★

ONE typical commercial user of such a material employs no filters or screens whatever in the circulating system, and has had the emulsion in the system for over a year by his own report. The

floating conglomerations of metal fines and soap, formed in the tank, are scooped out periodically and new emulsion makeup added to maintain necessary level in the tank.

★ ★ ★

TYPICAL pH valves are as follows on the freshly made emulsion:

2% emulsion — 9.5 pH
5% emulsion — 9.8 pH

★ ★ ★

Wire Drawing—Other Non-Ferrous Metals

ALTHOUGH copper and aluminum represent the predominant volume of wire drawn in the non-ferrous field, there are several other such metals which are drawn into wire form. The more important of these, other than the copper and aluminum alloys previously referred to, are:

1. Zinc
2. Tin
3. Lead
4. Nickel
5. Tungsten
6. The precious metals, gold, silver, platinum.
7. Lesser miscellaneous metals such as tantalum, zirconium, etc.

★ ★ ★

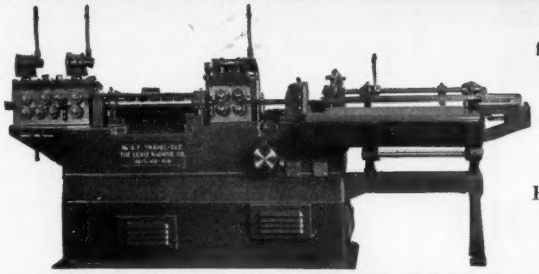
ZINC and its common alloys are readily drawn into wire form by wet wire methods. Pure zinc may be drawn without intermediate anneals but in alloys containing copper, intermediate annealing is desirable.

★ ★ ★

A NEUTRAL soap solution or emulsion made up with a drawing compound relatively low in soap and high in free fat should be used. The pH of the drawing emulsion should be kept as close to a neutral value as possible to prevent the formation of white zinc salts which will cause poor finish in drawing and white stains on the wire. For example, a pH of 10 will cause such results even on zinc coated steel wire, whereas a pH of about 8 with a more neutral solution will remedy such a condition. Use 2-3% concentration.

★ ★ ★

LEWIS TRAVEL-CUT WIRE STRAIGHTENING and CUTTING Machines



Machines for 1/16" to 3/4" rod
Round
Square
Flat
Hexagon
Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

LEWIS

The LEWIS MACHINE Co., 3445 E. 76 St., Cleveland, O.

REELS SPOOLS
ALL SIZES
WOOD- PLYWOOD -WOOD-METAL
RETURNABLE NON-RETURNABLE
Samples and Prices on Request
DURKEE MFG. CO. PINE RIVER, MINN.

REELS and SPOOLS
HOWSAM SPOOL COMPANY
500 RATHBONE AVE.
AURORA ILLINOIS

WE BUY WE SELL
We Pay Highest Prices for Used Machinery

FOR SALE
3 Farrell Intermediate String-up Machines
1200—24"x10" Mossberg Steel Reels $1.25 Ea.
1000—8" x 6" Mossberg Steel Reels $1.00 Ea.
100—New Style Wardwell Braiders
All Machines Reconditioned in Our Own Shop
WIRE & TEXTILE MACHINERY INC.
P. O. BOX 436, PAWTUCKET, R. I.

EASTWOOD WIRE
CENTRIFUGALLY-CAST FOR QUALITY

Phosphor Bronze — WIRE, FLAT
Nickel Silver — WIRE, ROD

Eastwood-Nealley CORPORATION
Belleville 9, New Jersey

DRAWING compounds similar to those used for copper wire drawing are suitable. For zinc coated steel wire a low soap—high fat steel wire drawing compound is recommended same as for carbon steel wire and in the same concentrations as for steel (i.e., about 2-2.5% in wet wire system).

★ ★ ★

TIN AND LEAD are both so ductile and susceptible to ready drawing and forming that little problem is presented. These metals lend themselves readily to extrusion and are frequently so formed into bar, rod, and wire.

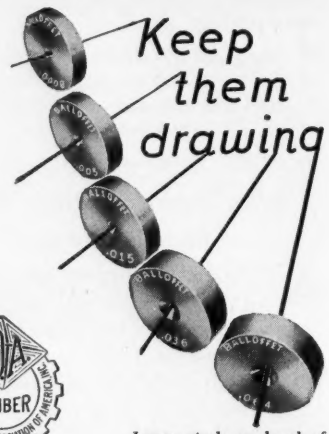
★ ★ ★

SOLDER WIRE is drawn down to size from a ¼" extruded tube which contains the solder flux.

★ ★ ★

ORDINARILY, a light compounded or straight mineral oil is used for such drawing. Viscosity may be S.S.U. 200-300 @ 100°F. and compounding, if used, consists of from 5-15% of fatty

Balloffet DIAMOND DIES



IDIA MEMBER Industrial Diamond Association of America

Large stock on hand of domestic and imported dies available for immediate shipment in sizes from .0004" to .081".

BALLOFFET
DIES AND NOZZLE CO., Inc.
6825 Adams St., Guttenberg, N. J.
Quality Diamond Dies Since 1870

PARALAN
The Lanolin Rust Preventive. Time Tested and Proven for
WIRE and STRIP STEEL

Write us for information

AMERICAN LANOLIN CORPORATION
Lawrence, Massachusetts

Warehouses:
Lawrence, Mass.
Cleveland, Ohio

TWO Ways To Get More Tons At LESS Cost

1. Oakite Pickle Control No. 3 prevents waste of steel and sulphuric acid; has shown savings up to 19 cents per ton in the pickle.

2. Oakite CrysCoat Process helps draw cleaner, brighter wire with superior rust-resistance.

FREE Write today for full information on these successful Oakite methods.

OAKITE PRODUCTS, INC.
52A Thames Street, NEW YORK 6, N. Y.
Technical Representatives in Principal Cities of U. S. & Canada

OAKITE
REG. U. S. PAT. OFF.
Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

BORAX

More shops are turning to this most satisfactory coating material. It is easy and safe to handle. Does not create dust nuisance.

Pins of wire which have been properly washed after the acid dip, sul coated and then coated with Borax have been satisfactorily drawn after remaining in storage for several weeks.

Borax coated wire used with proper lubricant will increase die life.

Demonstrate the effectiveness of Borax with a fair trial in your own shop as others have done.

Bulletin Submitted on Request

PACIFIC COAST BORAX COMPANY
NEW YORK • CHICAGO • LOS ANGELES

VIANNEY

Famous Wire Drawing Diamond Dies

All sizes from .080 down to .00039 in stock from New York.

Appropriate profiles available for soft, medium and hard metals or to your specifications.

VIANNEY WIRE DIE WORKS
250 E. 43rd St., New York
V. J. Boulin, Manager

oils, and fatty acids. Emulsions are sometimes used also.

★ ★ ★

NICKEL and NICKEL ALLOYS are drawn with lubricants either of the oil or emulsion type in wet wire systems, dependent upon the particular alloy and its properties.

★ ★ ★

THE range of suitable lubricants will consist of those products in both the oil and water soluble category which are commonly used for drawing steel and copper alloy wire.

★ ★ ★

TUNGSTEN, used principally in filament wire form in the electronic tube and incandescent lamp industries, is a ductile high strength metal which is drawn at elevated temperatures.

★ ★ ★

TYPICAL practice is to draw from 0.060″ down to 0.010″ through carbide dies at from 20-100 feet per minute. The so-called 0.060″ diameter "rod" is heated to about 2,000°F. The average temperature during drawing is about 1,800°F. This high work temperature favors even a severe reduction of the metal. From 0.010″ down to 0.003″ diameter the wire is again hot drawn through diamond dies.

★ ★ ★

THE most logical lubricant for operation at such high temperatures is graphite, usually applied in an aqueous or light oil vehicle to the wire to be drawn. The ve-

Wire Drawing Diamond Dies

COCHAUD
WIRE DIE CORPORATION
300 W. 56th St., NEW YORK
Tel. COlumbus 5-1340

DIAMOND DIES .0006 - .120 DIAMOND POWDER
INDUSTRIAL
AJAX
SUPPLIES INC.
R.R. 4, P.O. Box 66, Fort Wayne, Ind.

NEW ENGLAND WIRE DIE CO.
7 Forsberg St., Worcester, Mass.
EXPERT RECUTTING
DIAMOND DIES, DIAMOND POWDERS
Eastern Representative of
Ajax Industrial Supplies, Inc.

DIAMONDS for WIRE DRAWING DIES and CUTTING TOOLS
DIAMOND POWDER UNIFORM QUALITY
CHAMPION DIAMOND COMPANY, INC. 551 Fifth Ave., New York 17

DIAMOND DIES
.000's to .102
Fort Wayne Wire Die Inc.
2625 E. Pontiac St. Fort Wayne, Ind.

Diamond and Carbide
Wire Drawing Dies our specialty
HOOSIER WIRE DIE, INC.
P. O. Box 423, FT. WAYNE, IND.

DIAMOND WIRE DRAWING DIES
INDIANA WIRE DIE COMPANY
314-324 E. Wallace St.,
Fort Wayne, Indiana

WAYNE WIRE DIES STAND FOR QUALITY

in both DIAMONDS AND WORKMANSHIP

• QUALITY • QUALITY

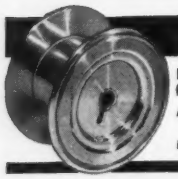
Highest quality dies manufactured for those who produce quality wire. Insist on the name "WAYNE" if you want long die life, high wire production, and good wire.

WAYNE WIRE DIE CO. 200 PENNSYLVANIA AVE., HILLSIDE 5, N. J.
Phone ELizabeth 2-2456 For Prompt Service

DIAMOND CARBIDE
DIES
KELLY
WIRE DIE CORPORATION
19 W. 34th St. New York

DIAMOND AND CARBIDE WIRE DRAWING DIES
RUSCH WIRE DIE CORPORATION
Croton-on-Hudson, N. Y.

TOOLS TALIDE DIES
WEAR PARTS
Talide Metal, the super hard tungsten carbide gives increased production, better finish, less down time and scrap on all wire mill operations.
METAL CARBIDES CORPORATION
YOUNGSTOWN 5, OHIO


ACROPAK
Drawn Aluminum Alloy Spools for Precision Wire Packaging
ACROMETAL PRODUCTS, INC.
604 Fifth Street North
MINNEAPOLIS 1, MINNESOTA

BOYD WIRE SPOOLERS
BOYD & SONS MANUFACTURING CO.
1434-38 Callowhill Street
Philadelphia 30, Pa.

WATER PROOF and CREPE PAPER
in rolls of any size for wrapping coils and reels.
CREPE-KRAFT BARREL LINERS
THE CREPE-KRAFT COMPANY
Division of National Waterproof Papers Inc.
Camden, N. J.

Wire Measuring...
PRODUCTIMETERS
Send for Catalog No. 40
Precision-built for accuracy and speed. Most complete line offered
DURANT MANUFACTURING CO.
1918 N. Buffum Street Milwaukee 1, Wisconsin • 118 Orange Street Providence 3, R. I.

NILSON AUTOMATIC PRESS and FOUR SLIDE MACHINES
For Swaging, Stamping, Piercing, Blanking & Forming Coiled Metal.
THE A. H. NILSON MACHINE CO.
BRIDGEPORT, CONN., U.S.A.

MUSIC WIRE
For Mechanical Purposes
Plain Polished, Tinned, Straightened and Cut Lengths
Fine Sizes — Special Wires — Strands and Cables — Spooled and Coiled Wires

Aluminum	Pure Iron
Annealed	Pure Nickel
Brass	Resistance
Copper	Stove Pipe Wire
Florists	Stainless
Monel	Straightened and Cut
Music Wire	Tag Wire
Nickel Silver	Trolling Wire
Oil Tempered	Leader Wire
Phosphor Bronze	
Picture Wire	

THE MALIN & CO.
2514 Vestry Ave., Cleveland 13, Ohio

hicle is flashed off, leaving the graphite coating on the wire surface.

★ ★ ★

GOLD, SILVER and PLATINUM characteristic precious metals, used in the jewelry and dental trades are all readily drawn to fine wire sizes by conventional methods. Gold and silver in relatively pure states are extremely ductile and easily drawn. Fine wire in these, or in platinum, are drawn through diamond dies. Palm oil, a soft soap such as potassium, or a fine soap powder are used for block drawing, while soap—fat emulsions or water solutions are used for wet-wire drawing of very fine sizes. Three to four percent concentration solutions are used.

★ ★ ★

SINCE these metals do not react readily with constituents in the lubricating solution, lubrication with some of the hard alloys may be troublesome. In such cases the lubricant may be required to contain additional metal soap, or a coating of soft silver or copper put on the alloy. Such a procedure, of course, makes for increased cost and difficulty in removal before annealing.

★ ★ ★

THERE are a number of lesser miscellaneous non-ferrous metals which are drawn into wire form. Among these are tantalum and zirconium, both used, among other things, in electronic tubes. Tantalum is also used in the medical field as suture wire. It draws about like low carbon steel and is subject to the same methods. Of course, the volume drawn commercially is extremely small.

★ ★ ★

ZIRCONIUM is quite ductile when annealed and draws readily although it work hardens rapidly. It has been drawn to extremely fine diameters (0.0012″) by special means.

★ ★ ★

RHODIUM (AND IRIDIUM), related to platinum, are worked hot (700-1100°C.) down to about 0.020″ diameter wire after which

SPECIALISTS IN
DRAWING COMPOUNDS
and
SOAP POWDERS
for
WIRE DRAWING
Established in 1906
NEIL C. POTTER
24 COMMERCE ST.
NEWARK 2, N. J.

WOOD REELS and SPOOLS
AMERICAN WOODWORKING COMPANY
1″ to 60″ Diameters
OVER 50 YEARS EXPERIENCE
1674 No. Lowell Avenue
Chicago, Ill.

OVENS — INDUSTRIAL
All Types—Batch or Conveyor for Welding Rods, Annealing, Tempering, Normalizing, Painting.
Write or Phone
DRYING SYSTEMS, INC.
1810B-Foster Ave., Chicago 40, Ill.

WIRE SPOOLING MACHINERY
ALL TYPES—ALL SIZES
ROBERT J. EMORY COMPANY
Sherman Ave. & Runyon St.
Newark 5, N. J.

HAVEG CORPORATION
NEWARK, DELAWARE
•
Manufacturers of Plastic Chemical Equipment

MOSSBERG
PRESSED STEEL CORP.
ATTLEBORO, MASS.
STEEL REELS AND SPOOLS

SLEEPER & HARTLEY, Inc.
Designers and Builders
SPRING COILERS
WIRE WORKING MACHINERY
WIRE MILL EQUIPMENT
SPECIAL MACHINERY
Address Inquiries to
Box 1249
WORCESTER, MASS.

BETTER BUILT
Spring Coilers
14 Models
Wire ranges .003" to .750"
Mill Equipment
Gang Slitters
Flat Wire Mills
Tube & Rod Straightener
The TORRINGTON MANUFACTURING COMPANY
TORRINGTON, CONN.
MORE ACCURATE

WIRE ANNEALING
FURNACES and PROCESSES
COIL LOADING and STRIPPING
MACHINES—WIRE SPIDERS
LEE WILSON ENGINEERING CO., INC.
Cleveland, Ohio • ACademy 4670

'Surface'
HEAT TREATING FURNACES
For Ferrous and Non-Ferrous Wire.
Prepared Atmosphere Generators.
SURFACE COMBUSTION CORPORATION
TOLEDO 1, OHIO

RUESCH
Machinery For
Wire, Tube, and Brass Mills
409 Mulberry Street, Newark, N. J.

WIRE DRAWING MACHINERY
AND EQUIPMENT
Rod Frames — 16" Frames, 8" Frames — Take-Up Frame, Wire — Pointers — Puller Tongs. — General and heat resisting alloy castings for wire mill use.
Circulars on Request.
E. J. SCUDDER FOUNDRY & MACHINE CO.
TRENTON, N. J.

NEP • SUMFOAM
ACID INHIBITOR • PICKLING COMPOUND
THE WM. M. PARKIN CO.
HIGHLAND BLDG. PITTSBURGH 6, PA.

Annealing Pots and Boxes
Galvanizing Kettles
Lead and Spelter Pans
Pressure Vessels
National Annealing Box Co.
Established 1895
Washington, Penna.

in the case of rhodium, is further cold drawn with intermediate anneals at each 50-60% reduction. Annealing is done at 750-800°C. Solid lubricants such as graphite are used at the elevated temperatures necessary for drawing. In general, rhodium and iridium resemble tungsten or molybdenum somewhat in their manner of working but at a somewhat lower temperature range.

★ ★ ★

References

1. "The Elements of Wire Drawing"—The Tool Engineer, July 1945—Pgs. 40-41.
2. E. L. H. Bastian, "Practical Development of Modern Wire Drawing Compounds"—Wire and Wire Products, October 1948.
3. B. H. McGar, "Lubrication for Forming and Wire Drawing"—Metals Handbook, 1948 Edition, Pgs. 69-70.
4. F. P. Bowden, "Importance of Chemical Attack in the Lubrication of Metals," Journal of the Institute of Petroleum, September 1948.
5. W. J. Hund, R. G. Larsen, Otto Beeck, Harold G. Vesper, "Some Aspects of Industrial Lubrication," Mechanical Engineering, July 1942, Pgs. 525-530.
6. R. G. Larsen and G. L. Perry "Investigation of Friction and Wear Under Quasi-Hydrodynamic Conditions," Transactions, A.S.M.E., January 1945.
7. Raymond Szymanowitz, "Colloidal Graphite Films—Properties and Applications." Electronic Industries, October 1943.
8. S. Schein, J. W. Forbes, "Fabrication of Tungsten Wire, Wire and Wire Products, October 1947.
9. E. M. Wise, "Precious Metals," Metals Handbook, American Society for Metals, 1948 Edition Pgs. 1093-1132.

★ ★ ★

METAL PICKLING EQUIPMENT
(Acid-Resisting)
Hairpin Type
Wire Pickling Yokes
CLARK E. GORDON, INC.
8-165 General Motors Building,
Detroit 2, Michigan

EISLER TRANSFORMERS
STANDARD and SPECIAL
AIR — OIL or WATER-COOLED
Sizes from ¼ to 400 KVA

FINE WIRE BUTT WELDERS • SPOT WELDERS
EISLER ENGINEERING CO., INC.
747 South 13th St. Newark 3, N. J.

THE MONTGOMERY COMPANY
Established 1871
25 CANAL STREET
WINDSOR LOCKS, CONN.
BARE ELECTRIC TINSEL CONDUCTOR and RESISTANCE TINSEL CORDAGE • TINSEL LAME • DECORATIVE TINSEL THREADS, CORDS, LAMINETTES

ROSS WIRE • ROD OVENS
J. O. Ross Engineering Corp.
350 Madison Avenue, New York 17, N. Y.
CHICAGO - BOSTON
DETROIT - LOS ANGELES

Specify SAUEREISEN
ACIDPROOF CEMENTS—COMPOUNDS
FOR
Tanks, Sewers, Stacks, Floors
Technical cements for all purposes.
Send sketches or samples
Sauereisen Cements Company • Pittsburgh 15, Penna.

ZINC STRIP AND WIRE
THE PLATT BROS. & CO.
WATERBURY 90, CONN.

WORLD'S LARGEST MANUFACTURER
SPIRAL WRAPPING MACHINES
For Coils or Straight Lengths
Terkelsen Machine Company
323 A Street, Boston 10

TRAUWOOD
Patenting, Annealing, Tempering, Galvanizing, and Tinning equipment for wire.
TRAUWOOD ENGINEERING CO.
Cleveland, Ohio.

WIRE WORKING MACHINERY
"Offered for Prompt Shipment"
WATERBURY-FARREL Continuous Wire Drawing Machines No. O Sleeve Type, Motor Driven with A. C. Motors, ¼" Cap. and Down, also others.
WATERBURY & MANVILLE Cold Headers and Thread Rollers.
NILSON & BAIRD Nos. 00, 0, 1, 2, 3 and 4 Four-slides.
U. S. TOOL Nos. 22, 25 and 33 MULTI-SLIDES.
SLEEPER & HARTLEY Nos. 1, 2, 3, 3½, 4 and 5 Universal Coilers.
TORRINGTON Nos. W11 & W205 Universal Coilers (some with Torsion Attachment).
LEWIS & SHUSTER Round and Shaped Wire Automatic Straightening and Cutting Machines.
NATIONAL MACHINERY EXCHANGE
128-138 MOTT ST. NEW YORK, N. Y.

Engineering and Professional Services

THE WALLACE G. IMHOFF CO.
Consultants in Zinc Coating
(Hot Galvanizing)
Hot Dip Tinning — Hot Lead Coating
905 SOUTH BEDFORD STREET
LOS ANGELES 35, CALIFORNIA

LANCASTER, ALLWINE & ROMMEL
REGISTERED PATENT ATTORNEYS
Suite 438, 815—15th St., N. W.
Washington 5, D. C.

●

Patent and Trade-Mark Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions.
Booklet and form "Evidence of Conception" forwarded upon request.

FATIGUE OF MATERIALS LABORATORY
PRINCETON, N. J.
Box 367
Corrosion-fatigue testing of wire a specialty.

SPRING CONSULTANTS
Design, Materials, Applications, Heat Treatment. Manufacturing, Looping, Coiling and Forming Tools, Surveys, Factory Layout.
THE CARLSON COMPANY
277 Broadway New York 7, N. Y.
BArclay 7-2552

CONSULTANT AND SPECIALIST
DRAWING LUBRICANTS
Hans C. Bick, Inc.
READING, PA.

KENNETH B. LEWIS
CONSULTING ENGINEER
Wire Mill Equipment, Layout and Practice
43 Midland St., Worcester, Mass.
Phone: Worcester 5-6033

EDWARD J. P. FISHER
METALLURGICAL ENGINEER
CONSULTANT TO THE WIRE INDUSTRY
PLANT . RESEARCH . DEVELOPMENT . CONTROL
Box 56 . NORTH JACKSON, OHIO . TEL. 2171

YOUR CARD
in a space like this
will announce the availability
of your services to the wire
industry. Write for rates.
WIRE AND WIRE PRODUCTS

WANTED
WIRE STRAIGHTENER AND CUTTER
Need a simple wire straightening and cutting machine with a capacity of 5/16", 3/8" or even 1/2"; lengths up to 8' or slightly more. High production not essential, but a simple reliable machine for small runs, giving a reasonably good cut off and reasonably straight wire. Contact W. H. Martin, The H. M. Harper Company, Morton Grove, Illinois.

POSITION WANTED
Superintendent or Supervising Foreman. Met. E. Grad., ex-Navy Officer, 12 Yrs. experience producing stainless steel wire, low carbon wire, nails. Reply Box No. 526, WIRE & WIRE PRODUCTS.

WANTED
Artos Model CS5 Cutting and Stripping machines.
Reply Box #529, WIRE & WIRE PRODUCTS.

FOR SALE
9—20 drafts Continuous Wire Drawing Machine equipped with both block and spooling attachments, for drawing wire 20 gauge and finer.
Box #530, WIRE & WIRE PRODUCTS

"Photography in Engineering"

THE above is the title of a book published in April by the **Chemical Publishing Company.** It is edited by C. H. S. Tupholme and contains 276 pages, with 262 photographs and figures.

★ ★ ★

EIGHT chapters cover the photography of drawings and documents, photography in the laboratory, high-speed photography, radiography, X-ray and electron diffraction and microradiography, processing and storing of X-ray material, infra-red photography, and motion pictures.

★ ★ ★

FOR photography in industry, the work will be found to be an excellent handbook. Copies cost $6.50 each and may be ordered through WIRE AND WIRE PRODUCTS.

★ ★ ★

DIAMOND TOOLS
by
Paul Grodzinski
PRICE $5.00

This book is concerned with industrial diamonds and other precious stones. It gives information about their production and qualities, their cutting and uses and, of course, devotes considerable space to the use and manufacture of diamond dies for wire drawing. One chapter is devoted to diamond powders.

Besides being profusely illustrated, there are many reference tables providing much useful data. An effort has been made to treat every phase of the subject in a practical and helpful manner. If you are making diamond dies or tools, or using them, you cannot afford to be without this book.

You may order it from this office. Just send check or order to:

WIRE & WIRE PRODUCTS
300 Main Street Stamford, Conn.

Index to Advertisers

A

Acrometal Products, Inc. 632
Ajax Industrial Supplies, Inc 631
Aluminum Company of America 559
American Chemical Paint Company 617
American Insulating Machinery Company 620
American Lanolin Corporation 630
American Woodworking Company 632
Apco Mossberg Company 624
Apex Alkali Products Co. 553
Armco Steel Corporation 567

B

Balloffet Dies & Nozzle Co., Inc. 630
Bethlehem Steel Company 554
Bick, Hans Co., Inc. 634
Blashill, Arthur 618
Boyd & Sons Manufacturing Co. 632
Bridge Mfg. Co., Inc. 606
Bruckner-Mitchell, Inc. 621

C

Carboloy Company, Inc. ..... 600 & 601
Carl-Mayer Corporation, The 623
Carlson Company, The 634
Champion Diamond Company, Inc. 631
Clark, J. L. Mfg. Co. 616
Cleveland Tramrail Division of the
Cleveland Crane & Engineering Co. 556
Cochaud Wire Die Corporation 631
Continental Steel Corporation 568
Crepe-Kraft Co., The
Division of National Waterproof Papers, Inc. 632

D

DuPont, E. I. de Nemours & Co. 557
Durant Mfg. Co. 632
Durkee Mfg. Co. 629
Drying Systems, Inc. 632

E

Eastern Carbide Corp. 574
Eastern Nail Company 622
Eastwood-Neally Corporation 630
Eisler Engineering Co., Inc. 633
Electric Furnace Company ..... Back cover
Emory, Robert J. Company 632
Entwistle, James L. Co. 580

F

Fatigue of Materials Laboratory 634
Firth Sterling Steel & Carbide Corporation 573
Fisher, E. J. P. 634
Fort Wayne Wire Die, Inc. 631

G

Glader, Wm., Machine Works 607
Gordon, Clark E., Inc. 633

H

Haveg Corporation 632
Hoosier Wire Die, Inc. 631
Howsam Spool Company 629
Hubbard Spool Company 562
Hudson Wire Co. 560
Hughesville Machine & Tool Company 619

I

Imhoff, Wallace G. Co., The 634
Indiana Wire Die Company 631
Industrial Ovens, Inc. 558
International Nickel Company, Inc. 570

J

Johnson Steel & Wire Company, Inc. 624

K

Kelly Wire Die Corporation 631
Keystone Steel & Wire Company 605

L

Lancaster, Allwine & Rommel 634
Lewis, K. B. 634
Lewis, Machine Co., The 629

M

Magnus Chemical Company ..... 575 & 593
Magnuson Products Corp. 626
Malin & Company, The 632
Martin, Glenn L. Company 555
Metal & Thermit Corporation 625
Metal Carbides Corporation 632
Mettler Machine Tool Inc.
Shuster Wire Machine Division 611
Micro Products Company 604
Miller, R. H. Co., Inc. 609
Modern Plastic Machinery Corp. 628
Montgomery Company, The 633
Morgan Construction Company 578
Mossberg Pressed Steel Corp. 632

N

National Annealing Box Co. 633
National Erie Corp. 615
National Machinery Exchange 633
New England Butt Company 613
New England Wire Die Co. 631
Niles Steel Products Div., Republic Steel Corp. 579
Nilson, A. H. Machine Co., The 632
North Anson Reel Company 587
Norton Company, The 622

O

Oakite Products, Inc. 630
Owens-Corning Fiberglas Corp. 572

P

Pacific Coast Borax Company 630
Parkin, Wm. M. Co., The 633
Pittsburgh Cut Wire Company 610
Platt Brothers & Co., The 633
Potter, Neil C. 632

R

Robertson, John, Co., Inc. 564
Rockwell, W. S., Company 627
Roebling's, John A., Sons Company 563
Roos, Tool & Mfg. Company 625
Ross, J. O., Engineering Corp. 633
Royle, John & Sons 608
Ruesch, H. J. Machine Co. 633
Rusch Wire Die Corporation 631

S

Sauereisen Cements Company 633
Scudder, E. J. Foundry & Machine Co. 633
Sjogren Tool and Machine Co., Inc. 627
Sleeper & Hartley, Inc. 632
Standard Industrial Compounds Co. 569
Steel Equipment Co. 614
Surface Combustion Corp. 633
Swift & Company 565
Syncro Machine Company 566

T

Terkelsen Machine Company 633
Torrington Mfg. Co. 633
Trauwood Engineering Co., The 633
Twitchell, E. W., Inc. 623

V

Vascoloy-Ramet Corporation 576
Vaughn Machinery Co. ..... Front cover
Vianney Wire Die Works 631

W

Waterbury Farrel Foundry & Machine Co. 571
Watson Machine Company ..... Inside Back cover
Wayne Wire Die Co. 631
Wean Equipment Corporation ..... Inside Front cover
Willey's Carbide Tool Co. 626
Wilson, Lee, Engineering Co., Inc. 633
Wire & Textile Machinery, Inc. 629

Y

Youngstown Sheet & Tube Company, The 561
Youngstown Welding & Engineering Company, The 612

WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyer's Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

ACID INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

ACID-PROOF CONSTRUCTION
Haveg Corporation, Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy., Inc., Pawtucket, R. I.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Ross, J. O., Engr. Corp., New York, N. Y.

BAR STOCK—Stainless Steel
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Company, Cleveland Chicago, New York.
Columbia Steel Co., San Francisco, Calif
U. S. Steel Export Company, New York, N. Y.

BOBBINS—Braider & Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

BORAX—Wire Drawing
Pacific Coast Borax Corp., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES—Pneumatic
Entwistle, Jas. L. Co., Pawtucket. R. I.

CABLE LACQUERING OVENS—
Industrial Ovens, Inc., Cleveland, O.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Mach. Co., Trenton, N.J.

CEMENTS—Acid Proof
Sauereisen Cements Co., Pittsburgh, Pa.

CEMENTS—Refractory
Norton Co., Worcester, Mass.
Sauereisen Cements Co., Pittsburgh, Pa.

CHEMICALS—Cleaning
(See Cleaners—Metal)

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Metal & Thermit Corp., New York, N. Y.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

CLEANING & PICKLING EQUIP.—
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corp., Newark, Del.
Metal & Thermit Corp., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

CLOTH TESTERS—
Scott Testers, Inc., Providence, R. I.

CLOTH—WIRE, All Metals
Roebling's, John A. Sons, Co., Trenton, N. J.
Wickwire Spencer Steel Division, Colorado Fuel & Iron Corp., Buffalo, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COILERS—Sheet, Strip and Wire
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J. Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

COLD HEADERS—
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Diamond
Hyprez Division, Engis Equipment Co., Chicago, Ill.
Magnus Chemical Co., Garwood, N. J.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corp., Lawrence, Mass.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corporation, Brooklyn, N. Y.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

CORROSION PREVENTIVES
Angier Corp., The, Framingham, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, New York.
Vascoloy-Ramet Corp., North Chicago, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Champion Diamond Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Champion Diamond Co., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Hyprez Division, Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND TOOLS—
Carboloy Co., Inc., Detroit, Mich.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide
(See Dies—Tungsten Carbide)

DIES—Cold Heading
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Vascoloy-Ramet Corp., No. Chicago, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Extrusion
Carboloy Co., Inc., Detroit, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Robertson, John, Co., Brooklyn, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Eyelet
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

WHERE TO BUY, Continued

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Flange Steel
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Modern Plastic Machinery Corp., Lodi, N. J.
Rockwell, W. S. Co., Fairfield, Conn.
Ross, J. O., Engineering Corp., New York, N. Y.

ENGINEERS—Consulting Hot Galvanizing
Wallace G. Imhoff Co., The, Los Angeles, Calif.

ENGINEERS—Consulting Spring Design
Carlson, Co., The, New York, N.Y.

ENGINEERS—Consulting Wire Mill
Fisher, Edward J. P., North Jackson, Ohio.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co. Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Robertson, John, Co., Brooklyn, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Heating, Strand
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

HOOKS—Pickling and Liming
Gordon, Clark E., Detroit, Mich.
Youngstown Welding & Engineering Co., Youngstown, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
Martin, Glenn L., Company, Baltimore, Md.
Owens Corning Fiberglas Corp., Toledo, O.
Twitchell, E. W., Philadelphia, Pa.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Morgan Construction Co., Worcester, Mass.
Roos, Tool & Mfg. Co., Montclair, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co. Waterbury, Conn.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUMBER—Wire Mill, for lagging and car blocking.
North Anson Reel Co., North Anson, Maine

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bead Wrapping
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H. Machine Co,, The, Bridgeport, Conn.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Boyd & Sons Manufacturing Co., Phila., Pa.
Rockwell, W. S., Co., Fairfield, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

WHERE TO BUY, Continued

MACHINERY—Coilers
Boyd & Sons Manufacturing Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Copper Wire Drawing and Rolling
Aetna-Standard Engineering Co., Youngstown, Ohio.
American Insulating Mach'y Co., Phila., Pa.
National Machinery Exchange (used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool, Inc., New Haven, Conn.
National Mach'y Exch. (Used) New York, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Porter, H. K., Inc., Everett, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Roos, Tool & Mfg. Co., Montclair, N. J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Aetna-Standard Engineering Co., Youngstown, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
Modern Plastic Machinery Co., Lodi, N. J.
National Erie Co., Erie, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Fence
Blashill, Arthur, Woodstock, Ont., Canada.
Glader, Wm., Machine Works, Chicago, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Modern Plastic Machinery Co., Lodi, N. J.
National Erie Co., Erie, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Bruckner-Mitchell, Inc., New York, N. Y.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R.I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Eastern Nail Co., Providence, R. I.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I

MACHINERY—Pickling
Gordon, Clark E., Detroit, Mich.
Youngstown Welding & Engineering Company, Youngstown, Ohio.

MACHINERY—Pointing
Aetna-Standard Engineering Co., Youngstown, Ohio.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
Royle, John & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila, Pa.
Bruckner-Mitchell, Inc., New York, N. Y.
Davis, R. L. Electric Co., Wallingford, Conn.
Eastern Nail Co., Providence, R. I.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd & Sons Manufacturing Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Modern Plastic Machinery Co., Lodi, N. J.
National Mach'y Exch. (Used), New York, N.Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
Hughesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Aetna-Standard Engineering Co., Youngstown, Ohio.
Ruesch, H. J., Machine Co., Newark, N. J.
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co. Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Testing Physical
Dillon, W. C. & Co., Inc., Chicago, Ill.
Eberbach & Son Co., Ann Arbor, Mich.
Scott Testers, Inc., Providence, R. I.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Aetna-Standard Engineering Co., Youngstown, Ohio.
Davis, R. L. Electric Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio.
Modern Plastic Machinery Co., Lodi, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Youngstown, Ohio.
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co. Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N.Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N.Y.

MACHINERY—Wrapping Straight Lengths and Tubing
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Wrapping Wire Coils
Angier Corporation, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MATERIAL—Resistance Heating Strand
Trauwood Engineering Co., Cleveland, Ohio.

MILLS—Tandem, Rolling & Edging
Torrington Mfg. Co., Torrington, Conn.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling, John A. Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
U. S. Steel Export Co., New York, N. Y.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Pa.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Angier Corp., The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corporation, The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING—Hooks, etc. Acid Resisting
Gordon, Clark E., Detroit, Mich.
Youngstown Welding & Engineering Company, Youngstown, Ohio.

PICKLING TANK LININGS—
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

PNEUMATIC CYLINDERS
Entwistle, James L. Co., Pawtucket, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

POTS—Lead Melting
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STANDS—
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS & SPOOLS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS & SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Chicago, Ill.
North Anson Reel Co., North Anson, Maine

REELS—Takeoff
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
North Anson Reel Co., North Anson, Maine

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing, Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engineering Corp., New York, N.Y.

RODS—Nickel Alloy
Eastwood Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

RODS—Stainless Steel
Armco Steel Corp., The, Middletown, Ohio.

RODS—Wire—Non-Ferrous
Eastwood Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

WHERE TO BUY, Continued

ROPE—Wire
American Steel & Wire Company, Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Roebling's John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel, Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc., Pawtucket, R. I.

SHEET—Steel
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANKS—Compound
Atlas Mineral Products Co. of Pa., Mertztown, Pa.
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Haveg Corp., Newark, Del.
Rockwell, W. S., Co., Fairfield, Conn.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
Rockwell, W. S., Co., Fairfield, Conn.
National Annealing Box Co., Washington, Pa.

TINSEL—Cords, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Electric Conductor
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Electric Resistance
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Lame, Silver and False Gold
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Thread, Silver and False Gold
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Thread, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila., Pa.
Davis R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Malin & Co., Cleveland, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
North American Philips Co., Inc., New York, New York
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div. of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland-Chicago, New York
Columbia Steel Co., San Francisco, Calif.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE—Nickel & Nickel Alloy
Eastwood-Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

WIRE—Nickel Silver and Phosphor Bronze
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
North American Philips Co., Inc., New York, New York.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
American Steel & Wire Co., Cleveland-Chicago, New York.
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Indiana.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U.S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland-Chicago, New York
Armco Steel Corp., The, Middletown, Ohio.
Columbia Steel Co., San Francisco, Calif.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting—
Pittsburgh Cut Wire Co., Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Angier Corporation, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Delaware
Owens Corning Fiberglas Corp., Toledo, Ohio.
Twitchell, E. W., Philadelphia, Pa.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

WATSON

ELECTRICAL WIRE AND CABLE, WIRE ROPE AND CORDAGE MACHINERY

NEW "SHAFTLESS" TAKEUPS-TYPE "H"

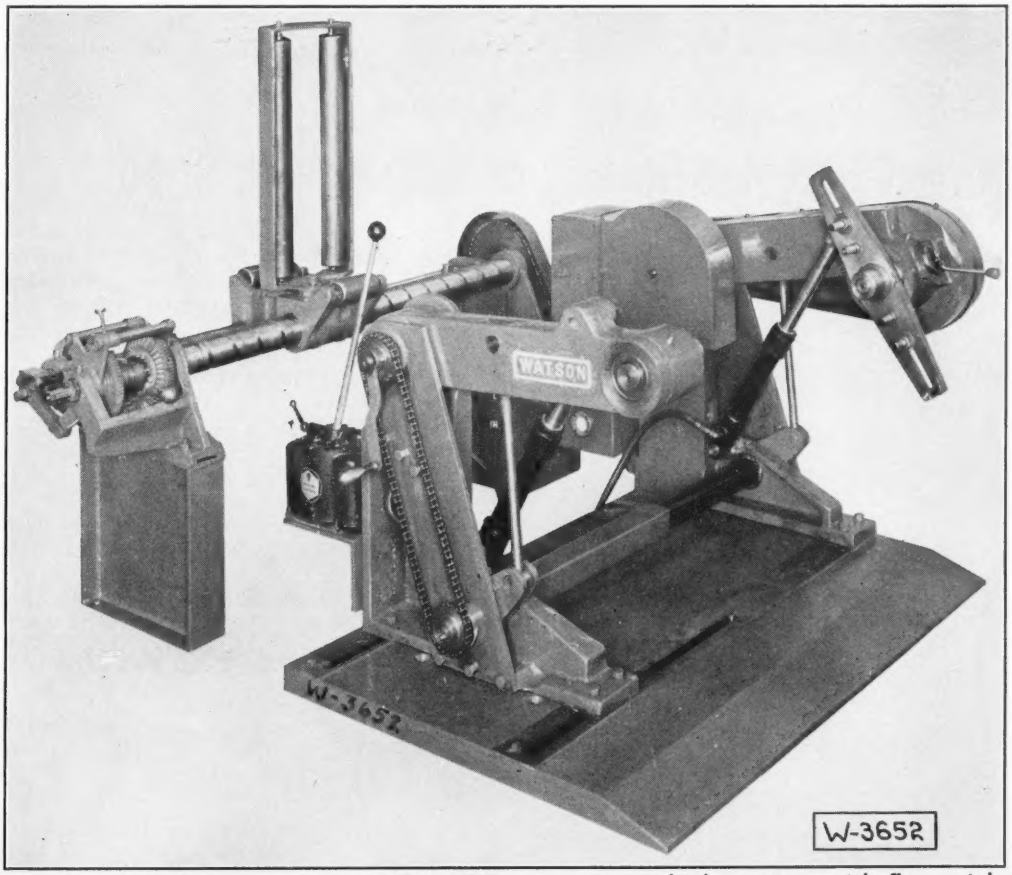
At a moderate price, these units offer many advantages over shaft types, among them:

SAFETY. No possibility of accidental injury due to reel shaft handling.

HYDRAULIC LIFT. Functions with greatest ease. Hand controlled, shockless lowering of fully loaded reels to floor.

DRIVE. Always in mesh. Permits reel winding at any height from floor. A few pump strokes suffice to clear reel from floor, ready for winding.

DESIGN. Heavy duty, fully ball bearing. Rapid adjustments for any reel within range. Reel entrance and exit in a minimum of time. Mounts our standard automatic traverses and transmissions.



Model illustrated above, our 50" HSD/40-RR, operates at high tensions with floor pickup of reels from 24" to 50" flange dia. Full 3-ton reels can be lowered and lifted. Width to user's specification. Multiple-disc-in-oil two speed transmission D/40 and automatic traverse RR provided here.—Other auxiliaries available.—Inquiries invited.

An EF gas fired radiant tube, roller hearth furnace clean and scale-free annealing nickel-silver and other alloy wire.

EF FURNACES FOR ANNEALING WIRE IN COILS, IN STRANDS ON REELS OR ON SPOOLS

High or low carbon wire, stainless steel—copper—brass—and other ferrous and nonferrous wire is being scale-free annealed, bright annealed or normalized, uniformly and continuously in EF furnaces. EF furnaces feature many service proved advantages conceived and perfected by the EF engineers and available only in EF design. These include the EF radiant tube and EF heat exchanger which combine to assure extremely high combustion efficiency; EF heavy, cast alloy electric heating elements, EF roller design and mounting, EF special atmosphere generators, and many other devices that assure uniform temperatures throughout the furnace, accurate control of heat within the required limits, low maintenance cost, high hourly output and dependable trouble-free operation.

EF furnaces are built in many different types, for performing a wide variety of heating processes. Sizes to meet any production requirement. Let the EF engineers work with you on your next wire furnace problem.

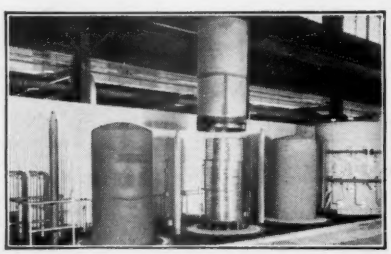
EF

THE ELECTRIC FURNACE CO.

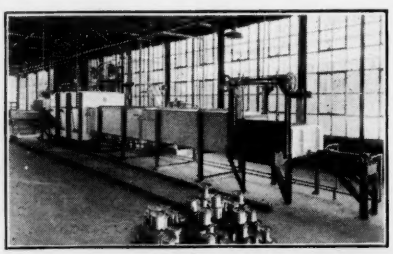
GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION

WILSON STREET *Salem - Ohio*

An EF combination gas fired radiant tube and electric furnace bright annealing 2500 pounds of copper wire per hour.



EF gas fired bell and other batch and continuous type furnaces are available for all wire treating processes.



EF electrically heated continuous special atmosphere furnace bright annealing fine copper wire on small spools.